U.S. DEPARTMENT OF THE INTERIOR

OFFICE OF WATER RESOURCES RESEARCH
WATER RESOURCES SCIENTIFIC INFORMATION CENTER

LIBRARY
JAN 2 1 1973
PACIFIC POWER & LIGHT
COMPANY

SELECTED WATER RESOURCES ABSTRACTS

VOLUME 5, NUMBER 23
DECEMBER 1, 1972

W72-13610 -- W72-14200

SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

SELECTED WATER RESOURCES ABSTRACTS is available to Federal agencies, contractors, or grantees in water resources upon request to: Manager, Water Resources Scientific Information Center, Office of Water Resources Research, U.S. Department of the Interior, Washington. D. C. 20240.

SELECTED WATER RESOURCES ABSTRACTS is also available on subscription from the National Technical Information Service. Annual subscription is $22 (domestic), $27.50 (foreign), single copy price $3. Certain documents abstracted in this journal can be purchased from the NTIS at prices indicated in the entry. Prepayment is required.

SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 5, NUMBER 23
DECEMBER 1, 1972

W72-13610 — W72-14200

Use of funds for printing this publication approved by the Director of the Bureau of the Budget, September 4, 1968.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1A. Properties

A SURVEY OF INDEXING AND ABSTRACTING SERVICES FOR WATER RESOURCES ENGINEERING,
Maryland Univ., College Park. Water Research Center.
For primary bibliographic entry see Field 10B.
W72-13820

ANOMALOUS WATER,
Tyco Labs. Inc., Waltham, Mass.
For primary bibliographic entry see Field 01B.
W72-13842

1B. Aqueous Solutions and Suspensions

ANOMALOUS WATER,
Tyco Labs. Inc., Waltham, Mass.
S. B. Brummer, J. I. Bradspies, G. Entine, E. Trickett, and H. Lingertat.
Available from NTIS, Springfield, Va 22151 as AD-737 295, for $3.00 paper copy; $0.95 microfiche. First Semiannual Technical Contract Report, January 1972. 54 p, 22 fig, 3 tab, 28 ref. Contract DAAHOI-71-C-1216 (ARPA).

Descriptors: *Water chemistry, *Gels, *Silica, *Water structure, *Synthesis, Water properties, Water types, Laboratory tests, Test procedures, Mass spectrometry, Condensation.
Identifiers: *Anomalous water, *Polywater, Zirconia-based glass.

Experiments were made on the preparation and characterization of anomalous water. Preparations are reported with various glass substrates drawn into the forms of cones. Zirconia-based glass yields the purest 'polywater' infrared spectrum. Data suggest that anomalous water is formed when glass reacts with certain (unidentified) airborne organic compounds. The final product appears to be the salt of an organic acid. Mass spectroscopy suggests a molecular weight of 207 for the most thermally stable component of this material. Refractive index data show that the material is similar to that produced in the USSR, and distillation-decomposition experiments argue strongly that none of their material is polymerized water. (Woodard-USGS)
W72-13842

AN EXPERIMENTAL STUDY OF THE STRUCTURE, THERMODYNAMICS AND KINETIC BEHAVIOR OF WATER,
Midwest Research Inst., Kansas City, Mo.
F. T. Greene, J. Beachey, and T. A. Milne.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $0.45. Office of Saline Water Research and Development Progress Report No. 772, February 1972, 33 p, 15 fig, 3 tab, 7 ref. OSW Contract 14-01-0001-1479.

Descriptors: *Thermodynamics, *Water structure, *Water types, *Mass spectrophotometry, *Kinetics.
Identifiers: *Dimers, *Trimers.

A mass spectrometer has been used to obtain equilibrium thermochemical data for water dimer and water trimer. This data is being used to derive kinetic information on water cluster formation. Specifically, experimental apparatus has been modified for use with the new single-focusing mass spectrometer and molecular beam sampling system, and significantly improved performance has been obtained. Reliable equilibrium thermochemical data have been obtained for water dimer as well as very encouraging preliminary data for water trimer and several larger polymers. Extensive measurements were also made of dimer and trimer concentrations following the free-jet expansion of water vapor from higher pressures. These data contain unique kinetic information. (OSW abstract)
W72-14060

PROPERTIES OF SEAWATER AND ITS CONCENTRATES AND RELATED SOLUTIONS AT TEMPERATURES UP TO 400 DEGREES F,
California Univ., Berkeley.
L. A. Bromley.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.00. Office of Saline Water Research and Development Report No. 747, February 1972, 96 p, 25 fig, 41 tab, 24 ref. Grant No. 14-30-2525.

Descriptors: *Seawater, *Thermal capacity, *Thermal properties, Physical properties, Thermodynamics.
Identifiers: *Sea salt solutions, *Heats of mixing, *Viscosities, Boiling point elevation.

Heat capacity measurements are reported for NaCl, KCl, MgSO4, Na2SO4 and MgCl2 solutions. Tables of Cs, saturation heat capacity, and Cp, heat capacity at constant pressure, are shown for varying salinities and temperatures. Polynomial equations obtained from curve fitting are given for both sets of values. Heats of mixing for sea salt solutions are reported for 73 degrees C. The relative enthalpies of sea salt solutions at 25 degrees C and 50 degrees C have been previously reported. A limited number of experimental boiling point elevations of sea salt solutions between 80 and 120 degrees C are reported. These are considered to be accurate to plus or minus 0.001 degrees C. Kinematic viscosity values for sea salt solutions to 11% salinity between 0 and 150 degrees C are reported. The values should be accurate to plus or minus 0.002 centistokes. (OSW abstract)
W72-14062

A NEUTRON SCATTERING STUDY OF THE KINETICS OF DIFFUSION AND THE RELATION TO THE STRUCTURES OF IONIC SOLUTIONS,
Union Carbide Corp., Tuxedo, N.Y.
G. J. Safford, and P. S. Leung.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $0.75. Office of Saline Water Research and Development Progress Report No. 708, July 1971. 78 p, 18 fig, 1 tab, 80 ref, append. OSW Contract 14-01-0001-1484.

Descriptors: *Water structure, *Water properties, Hydrogen bonding, Equilibrium, Solvation, Diffusion, Kinetics, Ion exchange, Chemical reactions, Hydration, Hydrate processes, Ions.
Identifiers: *Neutron scattering, *Salt hydration.

The frequencies characteristic of H2O molecules in hydration complexes and the associated diffusive kinetics were investigated by neutron scattering to determine (a) the dependence of the diffusive motions of ion-water complexes on temperature, on cation, and on anion, and to study their relationship to glass formation; (b) the changes in the hydration of ions and the diffusive kinetics which occur upon mixing in ternary solutions. For concentrated solutions of a series of lithium salts, of chromium salts, and of calcium nitrate with decreasing temperature, it has been shown that relaxation times characteristic of individual primary waters of hydration increase and exceed interaction time. (OSW contract)
W72-14067

02. WATER CYCLE

2A. General

DIGITAL SIMULATION OF THUNDERSTORM RAINFALL,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 02B.
W72-13634

APPLICATION OF MODELS IN GEOHYDROLOGICAL INVESTIGATIONS,
Koninklijke Nederlandsche Heidemaatschappij, Arnhem (Netherlands).
J. H. Van Ouwerkerk, and D. A. Zeilmaker.
Geologie en Mijnbouw (Netherlands), Vol 51, No 1, p 85-110, 1972. 1 tab, 469 ref.

Descriptors: *Model studies, *Hydrogeology, *Reviews, *Bibliographies, Analog models, Mathematical models, Groundwater movement, Hydraulic models.

The application of models in geohydrological investigations is closely related to the use of quantitative methods in groundwater hydrology. To help determine which type of model should be chosen an analysis of the following aspects is required: nature of the problems, structure of the hydrological system, types of models, and general conditions. The large number of factors involved in this analysis and the small numbers of results of alternative methods of investigations, preclude the formulation of a generally applicable rule of selecting a model. (Knapp-USGS)
W72-13731

ON SOME MODIFICATIONS IN THE VENETIAN CLIMATE DURING THE LAST THIRTY YEARS: REPERCUSSIONS OF THE PHENOMENON OF FLOOD WATERS,
Istituto Bioclimatol. Ospedale Mare, Lido, Venice (Italy).
For primary bibliographic entry see Field 02B.
W72-13757

EVALUATION OF A DETERMINISTIC MODEL FOR PREDICTING WATER YIELDS FROM SMALL AGRICULTURAL WATERSHEDS IN VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Research Div.
V. O. Shanholtz, J. B. Burford, and J. H. Lillard.
Available from the National Technical Information Service as PB-212 000, $3.00 in paper copy, $0.95 in microfiche. Research Division Bulletin 73, Aug. 1972, 213 p, 38 tab, 104 fig, 23 ref, 4 append. OWRR A-018-VA (5).

Descriptors: *Water yield, *Model studies, *Agricultural watersheds, Hydrographs, Forecasting, *Small watersheds, Hydrologic data, *Estimating.
Identifiers: *Stanford watershed model.

A Fortran version of the Stanford Watershed Model, without snowmelt, was used to generate streamflow data on two small agricultural watersheds. Five years of recorded data were used to 'calibrate' the model after which 5 additional years were generated using the model parameters developed for the first period. In general, annual water yield estimates appeared to be within measurement accuracy. Estimates for shorter periods tended to be less accurate with daily estimates showing considerable scatter. Errors in monthly flows when compared to respective annual yields were usually less than 5 percent. Estimates of maximum mean daily peak discharge were somewhat erratic. Absolute differences between estimates and observed values were not great; but,

because of small yields, percentage errors were in many instances very high. The model reproduced within acceptable limit, a given hydrograph, ignoring all other events during the year. Difficulty was encountered in obtaining a set of values for the model parameters that would give the best fit of water yield and peak discharge. In general, a sacrifice in peak estimates was required for the best fit of yields and vice versa, for the best fit of peaks. A variety of sensitivity runs were made to gage the effectiveness of different model parameters. The four most important parameters were the interflow index (CC), the infiltration index (DBI), lower zone storage index (FLZSN), and an infiltration - evaporation index (EF) for applying a seasonal variation to infiltration.
W72-13824

TECHNIQUES OF STATISTICAL EVALUATION OF RUNOFF RESULTS OF PRECIPITATION MODIFICATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel-Seytoux.
Available from NTIS, Springfield, Va 22151 as PB-208 836 for $3.00 paper copy; $0.95 microfiche. Final Contract Report, March 1972. 44 p, 11 fig, 11 tab, 20 ref. Contract 14-06-D-6597.

Descriptors: *Rainfall-runoff relationships, *Colorado River basin, *Weather modification, *Water resources development, *Runoff forecasting, Mathematical studies, Hydrologic data, Data collections, Prototype tests, Evaluation, Hydrology, Water demand, Precipitation (Atmospheric).
Identifiers: Statistical analysis.

Techniques were developed for evaluation of the effect of precipitation modification on runoff with special emphasis on the Colorado River Basin Pilot Project. The test variable is a linear combination of runoff variables with unknown weights. Maximization of the power of the test is achieved by a proper choice of the weights, compatible with constraints of a hydrologic nature. When applied to the Colorado River Basin Pilot Project area the power of the test, expressed in years needed for detection, is increased by a factor of two. If the precipitation increase is 10% on the average for the region over a 50-year period, the chance of detecting it in the runoff is slightly better than one in two. If the average precipitation increase over the same period is 15%, the chance jumps to seventeen in twenty. (Woodard-USGS)
W72-13841

AN INTEGRATION OF THE AGRICULTURAL DEMAND FUNCTION FOR WATER AND THE HYDROLOGIC MODEL OF THE PECOS BASIN,
New Mexico State Univ., University Park. Water Resources Research Inst.
For primary bibliographic entry see Field 06D.
W72-13993

DIGITAL COMPUTER MODELING OF LIMESTONE GROUNDWATER SYSTEMS,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 02F.
W72-14001

PROCEDURES FOR ESTIMATING THE HYDROLOGIC IMPACT OF URBANIZATION,
Regional Science Research Inst., Philadelphia, Pa.
For primary bibliographic entry see Field 04C.
W72-14002

DYNAMICS OF FLOOD FREQUENCY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W72-14003

STREAMFLOW SYNTHESIS -- A CASE STUDY,
Nevada Univ., Reno. Dept. of Civil Engineering.
V. L. Gupta, and J. W. Fordham.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 98, No HY6, Paper 8969, p 1049-1055, June 1972. 2 fig, 3 tab, 3 ref. OWRR A-037-NEV (2).

Descriptors: *Synthetic hydrology, *Simulation analysis, *Nevada, Data collections, Data processing, Mathematical models, Statistical models, Statistical methods, Statistics.
Identifiers: Truckee River (Calif), Lake Tahoe.

A statistical simulation was prepared for monthly streamflow sequences in a multiple-site configuration in the Tahoe-Truckee system. Data preparation consisted of: (1) conversion of historic streamflow values, wherever necessary, to what the values would be if it were not for regulation; and (2) reconstitution of missing flow values in the record. The general statistical properties of the simulated sequences were comparable to those of historic sequences. Inconsistencies with regard to monthly water balance of the simulated sequences are outlined. (Knapp-USGS)
W72-14005

THEORY OF STOCHASTIC MODELING OF WATERSHED SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
V. T. Chow, and T. Prasad.
Journal of Hydrology, Vol 15, No 4, p 261-284, April 1972. 7 fig, 6 tab, 9 ref. OWRR B-038-ILL (8).

Descriptors: *Statistical models, *Rainfall-runoff relationships, *Mathematical models, *Stochastic processes, Regression analysis, Model studies, Systems analysis, Time series analysis, Storm runoff, Statistical methods.
Identifiers: *Stochastic models, French Broad River (NC).

A theory of stochastic modeling of watershed systems is proposed. Hydrologic phenomena may be expressed as stochastic hydrologic systems in terms of mathematical models whose components are represented by stochastic processes. These stochastic hydrologic models are based on mathematical formulation of the principle of systems continuity. The component stochastic processes are precipitation, runoff, evapotranspiration, losses, and basin storage. An annual storm-flood model is used to simulate the hydrologic system of a watershed. The input hourly rainfall of the annual storm is represented by a first-order nonstationary Markov chain and the annual storm-flood is represented by multiple linear regression. The rainfall and runoff relationship of the watershed is represented by a bivariate Markov process. As a numerical example for the analysis, the French Broad River basin above Bent Creek, North Carolina is used as the watershed for the model. (Knapp-USGS)
W72-14007

2B. Precipitation

DIGITAL SIMULATION OF THUNDERSTORM RAINFALL,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
U. A. Sorman, and J. R. Wallace.
Available from the National Technical Information Service as PB-211 806, $3.00 in paper copy, $0.95 in microfiche. Georgia Environmental Resources Center, Atlanta, Report ERC-0972, August 1972. 177 p, 49 fig, 10 tab, 55 ref, 3 append. OWRR A-036-GA (1).

Descriptors: *Thunderstorms, *Simulated rainfall, *Rainfall intensity, *Cloud bursts, *Hydrologic models, Storm structure, Spatial distribution, Temporal distribution, Rainfall gages, *Georgia, Southeast U.S., *Coastal plains, Model studies, *Stochastic processes.
Identifiers: Little River Watershed, Tifton (Ga.).

The purpose was to obtain a better understanding of the temporal and spatial variability of thunderstorm rainfall and to develop a digital model for the stochastic simulation of thunderstorm rainfall for the Southeast Coastal Plain areas. Rainfall patterns were thoroughly analyzed from rainfall data made available by the Agricultural Research Service, U. S. Department of Agriculture. Statistical properties and frequency distributions of rainfall cell characteristics, such as cell duration, size, spatial and temporal distribution of rainfall intensity, cell movement, and the number and orientation of cells, were analyzed. A digital model of thunderstorm rainfall was formulated from observed storm cell characteristics and the parameters of the model were evaluated from isolated thunderstorms. The model tochastically generates rainfall patterns for ten-minute intervals and the rainfall intensity and location of the rainfall cell vary with time. Knowledge was developed on the characteristics of summer thunderstorm rainfall in the Coastal Plain areas of Georgia. The size, movement, and intensity of rainfall from thunderstorm cells measured, and a stochastic model was developed which will generate precipitation patterns like those observed by a raingage network. (Conway-Ga.Tech)
W72-13634

AN ANALYSIS OF THE RAINFALL VARIATIONS IN COUNTY LEITRIM AND THEIR INFLUENCE ON AGRICULTURAL PRODUCTION,
Foras Taluntais, Drumboylan (Ireland).
For primary bibliographic entry see Field 03F.
W72-13713

TUNABLE INFRARED LASER SPECTROSCOPY OF ATMOSPHERIC WATER VAPOR,
Massachusetts Inst. of Tech., Lexington. Lincoln Lab.
F. A. Blum, K. W. Nill, P. L. Kelley, A. R. Calawa, and T. C. Harman.
Science, Vol 177, No 4050, p 694-695, August 25, 1972. 1 fig, 1 tab, 12 ref.

Descriptors: *Infrared radiation, *Water vapor, *Spectroscopy, *Meteoric water, Atmosphere, Absorption, Methodology, Remote sensing, Analytical techniques.
Identifiers: *Laser radiation.

Water vapor plays a prominent role in determining the infrared properties of the atmosphere. Absorption lines in the v sub-2 band of water vapor at 6.3 micrometers have been fully resolved by using a tunable semiconductor laser. Three atmospheric vapor lines near 5.32 micrometers were studied in detail and found to have line widths two to four times narrower that the width calculated by Benedict and Kaplan. (Lang-USGS)
W72-13732

ON SOME MODIFICATIONS IN THE VENETIAN CLIMATE DURING THE LAST THIRTY YEARS: REPERCUSSIONS OF THE PHENOMENON OF FLOOD WATERS,
Istituto Bioclimatol. Ospedale Mare, Lido, Venice (Italy).
A. Giordani-Soika, and D. Meneghini.
Boll Mus Civ Stor Nat Ven. 20/21, p 13-26. 1970.
Identifiers: *Wind velocity, Climate, *Floods, Italy, Modifications, Repercussions, Years.

The analysis of extensive meteorological records shows that the unusually high tides of recent years have been caused by the increased intensity of prevalent winds.--Copyright 1972, Biological Abstracts, Inc.
W72-13757

FOUR-DIMENSIONAL WORLD-WIDE ATMOSPHERIC MODELS (SURFACE TO 25 KM ALTITUDE),
Allied Research Associates, Inc., Baltimore, Md. Baltimore Div.
D. B. Spiegler, and M. G. Fowler.
National Aeronautics and Space Administration Contract Report (NASA CR-2082), July 1972. 66 p, 29 fig, 8 tab, 7 ref. NASA Contract NA58-26928.

Descriptors: *Weather forecasting, *Meteorological data, *Computer models, *Atmospheric physics, Input-output analysis, Moisture, Pressure, Temperature, Density, Cloud physics, Precipitation (Atmospheric), Cloud cover, Attenuation.

Four-dimensional atmospheric models previously developed for use as input to atmospheric attenuation models are evaluated to determine where refinements are warranted. A computerized technique was developed that has the unique capability of extracting mean monthly and daily variance profiles of moisture, temperature, density and pressure at 1 km intervals to the height of 25 km for any location on the globe. This capability could be very useful to planners of remote sensing of earth resources missions in that the profiles may be used as input to the attenuation models that predict the expected degradation of the sensor data. Recommendations are given for procedures to use the four-dimensional models in computer mission simulations and for the approach to combining the information provided by the 4-D models with that given by global cloud models. (Woodard-USGS)
W72-13843

RELATION OF PRECIPITATION TO SOIL TEMPERATURE (2ND REPORT)--EFFECT OF SOIL MOISTURE ON HEAT-EXCHANGE IN THE SOIL,
Fukushima Univ. (Japan). Dept. of Earth Science.
For primary bibliographic entry see Field 02G.
W72-13845

ESTIMATING THE WETTING OF WALLS BY DRIVING RAIN (OB OTSENKE UVLAZHENIYA STEN PRI KOSYKH DOZHYDAKH),
Main Geophysical Observatory, Leningrad (USSR).
For primary bibliographic entry see Field 07B.
W72-13855

USE OF ZAYTSEV METHOD FOR DETERMINING THE WATER CONTENT OF FOGS IN CHAMBERS,
For primary bibliographic entry see Field 07B.
W72-13863

TEST OF RUNOFF INCREASE DUE TO PRECIPITATION MANAGEMENT FOR THE COLORADO RIVER BASIN PILOT PROJECT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 03B.
W72-13912

ELECTRICITY OF CLOUDS,
I. M. Imyanitov, Ye. V. Chubarina, and Ya. M. Shvarts.
Available from NTIS, Springfield, Va 22151 as NASA TT F-718. Price $3.00 paper copy. National Aeronautics and Space Administration Technical Translation (NASA TT F-718), June 1972. 122 p, 18 fig, 16 tab, 181 ref. (Trans. of 'Elektrichestvo oblakov', Leningrad, 1971).

Descriptors: *Clouds, *Electrical properties, *Cloud physics, *Electricity, *Atmosphere, Data collections, Lightning, Storm structure, Electrical properties, Electric fields, Electrical resistance, Thunderstorms, Rainfall.
Identifiers: *Cloud electricity.

Data are presented on electrical characteristics of clouds including the electrical properties of clouds, the processes which lead to cloud electrification, methods devised by man to change the electrical properties of clouds, and the influence of electrical properties on cloud development. On the basis of the distributions of potential gradients of the electrical fields in and near clouds, the distributions of densities of space charges can be determined, and by including the effects of the electrical conductivity of the air and the field of air movement velocities, it is possible to calculate the distribution of the total electrical current density of the atmosphere. This report is designed to serve as an aid in bridging the gap between the concepts of specialists in atmospheric electricity and the concepts of specialists in other studies of cloud electricity. A bibliography containing 181 documents is included. (Woodard-USGS)
W72-14039

MAN AND HIS ENVIRONMENT: CLIMATE,
For primary bibliographic entry see Field 06G.
W72-14137

2C. Snow, Ice, and Frost

THE BIODEGRADATION OF ORGANIC SUBSTRATES UNDER ARCTIC AND SUBARCTIC CONDITIONS,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 05C.
W72-13822

PERMAFROST IN CANADA.
Geological Survey of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 07C.
W72-13831

SNOWFALL AND SNOW TRANSPORT DURING SNOWSTORMS OVER THE USSR,
Main Geophysical Observatory, Leningrad (USSR).
V. M. Mikhel, A. V. Rudneva, and V. I. Lipovskaya.
Available from the National Technical Information Service as TT-70-50181, $3.00 in paper copy, $0.95 in microfiche. National Oceanic and Atmospheric Admin., by Israel Program for Scientific Translations, Jerusalem, 1971. 174 p, 35 fig, 11 tab, 145 ref. Trans. of Perenosy Snega Pri Metelyakh i Snegopady Na Territorii SSR, Leningrad, 1969.

Descriptors: *Snow, *Snow cover, *Snowpacks, *Snowfall, *Storms, Meteorology, Wind velocity, Atmospheric pressure, Water equivalent, Depth, Density, Distribution, Variability, Probability, Frequency, Zoning, Mapping, Agriculture, Transportation, Precipitation gages.
Identifiers: *USSR, *Snow transport, Anemoscopes.

This book analyzes the physical conditions of snowstorms in various physiographic regions of the USSR and presents methods of calculating snow transport during snowstorms. Three types of snowstorms are identified: (1) a general snowfall where atmospheric pressure is less than 1,015 mb; (2) blowing snow where atmospheric pressure is greater than 1,015 mb and no precipitation collects in the precipitation gage; and (3) drifting snow. Depth, density, water equivalent, and geographic distribution of snow cover are analyzed in connection with the intensity, duration, and amount of transported snow. Analysis of snowpack and snow transport characteristics will help climatologists and scientific workers in various branches of the national economy assess the effects of snow on surface transportation systems and the importance of snow control in agriculture. (Josefson-USGS)
W72-13852

DISTRIBUTION PATTERNS FOR SOME PARTICULATE AND DISSOLVED TRACE METALS WITHIN AN ACTIVE GLACIAL FJORD,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 05B.
W72-13973

DEVELOPMENT OF FOREST MANAGEMENT PRACTICES FOR INCREASING SNOWPACK WATER YIELD,
Arizona Univ., Tucson. Dept. of Watershed Management.
P. F. Ffolliott, and D. B. Thorud.
Available from the National Technical Information Service as PB-212 029, $3.00 in paper copy, $0.95 in microfiche. Completion Report, September, 1972, 5 p. OWRR A-029-ARIZ (2).

Descriptors: *Snowpack, *Snow management, *Water yield improvement, *Forest management, *Arizona, Ponderosa pine trees.
Identifiers: *Forest Management Guidelines, *Snowpack runoff.

Much of the recoverable precipitation in Arizona originates from snowpacks occurring in the ponderosa pine type of the State. Water yields from these snowpacks provide surface water supplies to Phoenix and central Arizona, where groundwater tables are declining. Forest management practices aimed at increasing water yields may be one alternative for relieving water shortages in this area. Source information was obtained for the preparation of forest management guidelines designed to increase snowpack water yield. Specifically, guidelines for reducing timber density and complete removal of timber overstories appropriate to the ponderosa pine type of Arizona, and designed to increase snowpack water yield, were formulated. Hopefully, with these guidelines, land managers will be able to prescribe and implement forest management practices likely to provide maximum snowpack accumulation onsite, and to identify sites likely to yield maximum snowpack runoff. To facilitate operational application, the effects of proposed guidelines on water, wood, forage, wildlife, and aesthetic qualities of the land were considered in physical and economic analyses. (See also W72-13996)
W72-13995

USE OF FOREST ATTRIBUTES IN SNOWPACK INVENTORY - PREDICTION RELATIONSHIPS FOR ARIZONA PONDEROSA PINE,
Arizona Univ., Tucson. Dept. of Watershed Management.
D. B. Thorud, and P. F. Ffolliott.
Journal of Soil and Water Conservation, Volume 27, Number 3, p 109-111, May-June 1972. 1 fig, 2 tab, 14 ref. OWRR A-014-ARIZ (7).

Descriptors: *Snowpack, *Snow management, *Water yield improvement, *Forest management, *Ponderosa pine trees, *Arizona.

Inventory-prediction equations describing snowpack accumulations as functions of readily available or easily obtained measurements of forest density and land form were developed for use in Arizona ponderosa pine (Pinus ponderosa Laws.). Although empirical, these equations include forest density measurements assumed to index interception of input precipitation, obstruction of direct-beam solar radiation, and radiation emission from trees onto the snowpack. Measurements of land form factors index the quantity of direct-beam solar radiation. (See also W72-13995)
W72-13996

RIVER DISCHARGE INTO AN ICE-COVERED OCEAN AND RELATED SEDIMENT DISPERSAL, BEAUFORT SEA, COAST OF ALASKA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02J.
W72-14020

GROWTH OF A TALUS CONE IN THE WESTERN CHUGACH MOUNTAINS, ALASKA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02J.
W72-14026

USE OF CAPILLARY COLUMNS TO STUDY INFILTRATION OF WATER INTO FROZEN SOIL (SKHEMA KAPILLYARNYKH KOLONN DLYA VPITYVANIYA VODY V MERZLYY GRUNT),
Severni Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Leningrad (USSR).
For primary bibliographic entry see Field 02G.
W72-14031

CALCULATION OF RATE OF EXTENSION OF ICE COVER IN AFTERBAYS OF RESERVOIRS (RASCHET NASTUPLENIYA KROMKI LEDYANOGO POKROVA V NIZHIKH B'YEFAKH VODOKHRANILISHCH),
Gidrometeorologicheskii Nauchno-Issledovatelskii Tsentr, Leningrad (USSR).
V. A. Miloshevich.
Meteorologiya i Gidrologiya, No 12, p 59-64, December 1971. 1 fig, 8 ref.

Descriptors: *Ice, *Ice cover, *Afterbays, *Reservoirs, *Flow, Flow rates, Properties, Heat balance, Heat transfer, Heat flow, Temperature, Air temperature, Water temperature.
Identifiers: *USSR, *Ice properties, Ice thickness, Ice accretion.

Factors which determine average rate of extension of ice cover on rivers in afterbays of reservoirs are: (1) rate of heat transfer in the ice-forming reach; (2) length of the ice-forming reach; (3) average open-channel rate of flow; (4) density of ice; and (5) density of water. Equations are developed to compute rate of ice extension and position of the ice edge. Results obtained for 160 computed ice-extension rates are within 10% of the true value in 34 cases and within 20% of the true value in 87 cases. In 149 cases, the computed rates are within 40% of true values. (Josefson-USGS)
W72-14033

PHYSICS OF FRESHWATER ICE (FIZIKA PRESNOVODNOGO L'DA),
V. V. Bogorodskiy, A. V. Gusev, and G. P. Khokhlov.
Gidrometeoizdat, Leningrad, 1971. 228 p.

Descriptors: *Ice, *Ice cover, *Freshwater, *Physics, *Physical properties, Water properties, Water structure, Molecular structure, Snow, Freezing, Crystallization, Crystallography, Acoustics, Electrical properties, Mechanical properties, Thermal properties, Radiation, Measurement, Investigations, Equations.
Identifiers: *USSR, *Freshwater ice, *Ice properties, *Ice structure, *Ice crystals, Ice thickness, Ice formation.

This monograph, which consists of 9 chapters, examines the physical processes occurring during freezing of water and growth of ice cover and the properties and structure of ice. Specific topics discussed include: (1) physics of the liquid state and phase transitions of water; (2) formation of ice cover; (3) thermal properties of ice; (4) radiation properties of ice; (5) methods of measuring mechanical properties of ice and snow; (6) mechanical properties of freshwater ice and snow; (7) application of acoustical methods to the study of ice; (8) electrical properties of ice; and (9) electromagnetic methods of measuring ice thickness. The text will prove of particular value to hydrologists and geophysicists interested in the latest techniques of ice research. (Josefson-USGS)
W72-14037

OIL AND THE ECOLOGY OF THE ARCTIC,
Alberta Univ., Edmonton. Dept. of Botany.
For primary bibliographic entry see Field 05C.
W72-14188

2D. Evaporation and Transpiration

SIMULTANEOUS DETERMINATION OF SHORT-PERIOD PHOTOSYNTHESIS AND EVAPOTRANSPIRATION,
Nebraska Univ., Lincoln. Dept. of Horticulture and Forestry.
For primary bibliographic entry see Field 03F.
W72-14009

DISPOSAL OF BRINE BY SOLAR EVAPORATION,
New Mexico State Univ., University Park.
N. N. Gunaji, and C. Keyes, Jr.
Available from the National Technical Information Service as PB-206 045, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 351, May 1968. 213 p, 58 fig, 20 tab, 65 ref, 4 append. Contracts 14-01-0001-511 and 14-01-0001-969.

Descriptors: *Brine disposal, *Brines, *Solar radiation, *Evaporation, Energy balance, Waste disposal, Desalination, New Mexico.
Identifiers: *Evaporation rates, *Mass transfer method, Effluent ponds, Energy budget method, Dyes, Water budget method, *Roswell (N Mex).

An investigation was made to determine the rate of evaporation of brine in solar ponds by methods of energy budget, water budget and mass transfer. The investigation included the effect of salinity and dyes on solar evaporation of brine at Roswell, New Mexico. The dyes used in the study were: Bismark Brown, Congo Red, Methylene Blue, Naphthol Green and Nigrosine Dyes. The water budget method for determining evaporation depth in a Modified Cummings Radiation Integrator is more reliable than the Energy Budget Method. Naphthol Green was found to increase evaporation more than the other dyes. (OSW abstract)
W72-14077

THE EFFECT OF FRUITING UPON TRANSPIRATION RATE AND STOMATAL OPENING IN APPLE LEAVES,
For primary bibliographic entry see Field 03F.
W72-14097

TRANSPIRATION OF ANTIRRHINUM MAJUS L. 'PANAMA' AS INFLUENCED BY SOIL TEMPERATURE,
Georgia Univ., Athens. Dept. of Horticulture.
R. B. Rutland, and J. E. Pallas, Jr.
J Am Soc Hort Sci, 97 (1): 34-37, Illus, 1972.
Identifiers: *Antirrhinum-Majus-D, Panama, *Soil temperature, Stomatal, Suction, *Transpiration, Wilting.

The rate of transpiration of A. majus L. 'Panama' increased as the daytime temperature (T) was increased in the range 20 deg C to 35 deg C while vapor pressure deficit (v.p.d.) and night T were held constant in a controlled environment chamber. Transpiration rates declined when day T was 20 or 25 deg C after nights of 15 deg C, but remained steady during days of 30 or 35 deg C following 15 deg C nights. The slower rates of soil warming with 20 and 25 deg C days after 15 deg C nights influenced the rate of transpiration by causing early morning wilting and by increasing stomatal resistance (RS). The decline in transpiration at 20 and 25 deg C was similar to that observed when soil water suction was increasing and slowing water flow. Total daily transpiration was 1/3 less when rhizosphere T was controlled at 10 deg C in contrast with 25 deg C when plants were grown in either a gravel-peat-vermiculite medium or nutrient solution. Plants in 25 deg C soil responded to increasing evaporative demand by increasing transpiration, but those in 10 deg C soil wilted under even low v.p.d. and transpired at a low rate under any condition tested. The declining rate of transpiration at 20 and 25 deg C during the day when soil T was not controlled was due to cold soil. This work suggests that under glass culture, where wilting can be identified as a result of cold soil, soil heating may be necessary as a preventative treatment.--Copyright 1972, Biological Abstracts, Inc.
W72-14102

AN INSTRUMENT FOR CONTINUOUS RECORDING OF NATURAL EVAPORATION,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
For primary bibliographic entry see Field 07B.
W72-14136

2E. Streamflow and Runoff

A STATISTICAL ANALYSIS OF BASE-FLOW FLOOD DISCHARGE DATA,
Cornell Univ., Ithaca, N.Y.
R. M. Shane.
Available from University Microfilms, Ann Arbor, Michigan, Order No. 67-1409, Microfilm $3.00, Xerox $5.40. Ph. D. Dissertation, 1966, 106 p.

Descriptors: *Flood forecasting, *Mathematical models, *Statistical methods, Base flow, Design flood, Design flow, Model studies.
Identifiers: *Method of maximum likelihood, Confidence limits.

A probability model was developed from assumptions made about the occurrence of flood peaks. Equations were derived which relate design flow to several commonly used measures of risk. These equations contain parameters which must be estimated from base flow data. Estimators which require very little computation were developed using the method of maximum likelihood. Also, confidence limits for design flow were presented which can be used for predicting the design flow necessary to provide a desired level of risk with some specified degree of confidence. The uncertainty of a prediction due to the inherent random nature of flood occurrences was separated from the uncertainty due to a finite length of record. (Galwardi-Texas)
W72-13700

FLOODING ALONG THE RIO PIEDRAS IN THE SAN JUAN AREA, PUERTO RICO,
Geological Survey of Puerto Rico, San Juan.
For primary bibliographic entry see Field 07C.
W72-13714

PREHISTORIC NEAR-SURFACE SUBSIDENCE CRACKS IN WESTERN FRESHNO COUNTY, CALIFORNIA,
Geological Survey, Washington, D.C.
W. B. Bull.
Available from GPO, Washington, DC 20402-Price $1.75. Geological Survey Professional Paper 437-C, 1972. 85 p, 65 fig, 2 plate, 3 tab, 40 ref.

Descriptors: *Land subsidence, *Wetting, *California, *Paleohydrology, *Alluvial fans, Alluvium, Alluvial channels, Compaction, Irrigation water, Canals, Soil physical properties, Stress, Stratigraphy.
Identifiers: *Fresno County (Calif).

Thousands of clay-filled tension cracks found in the alluvial fans of the San Joaquin Valley, Calif., during the excavation of the California Aqueduct raised the possibility of postconstruction tensional rupture of the canal. Virtually all the cracks in the large fans are the result of prehistoric compaction due to wetting caused by streamflow. Evidence for prehistoric cracking includes cracks that parallel former stream courses, crack fillings truncated by buried stream channels, crack filling in the present streambanks, variable depth of burial of the crack tops, absence of widespread historic near-surface subsidence, and the presence of field capacity moisture conditions in the deposits of unirrigated areas. About 5-10 feet of near-surface subsidence occurred on the large fans after accumulation of at least 65 feet of deposits during the last 45,000-100,000 years-deposits that remained moisture-deficient even during times of Pleistocene glacial and lacustrine expansion. The wetting of the moisture deficient deposits occurred during the last 10,000 years. Depths of crack burial indicate that wetting has continued to the present time on the large fans, but ceased on the small fans about 5,000 years ago. The possibility of future near-surface subsidence on the large fans which would cause serious damage to the San Luis Canal section of the California Aqueduct is slight, because nearly all the cracks in the large fans are prehistoric. Small pockets of moisture-deficient deposits left as a result of erratic prehistoric percolation from the streams probably have been wetted and compacted during 20 years of irrigation. (Knapp-USGS)
W72-13717

WATER-QUALITY RECONNAISANCE OF THE LOWER SANTA ANA RIVER CANYON, SOUTHERN CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02K.
W72-13720

AN EXPERIMENTAL STUDY OF THE GROWTH OF MECHANICALLY GENERATED SURFACE WATER WAVES WHEN SUBJECTED TO A FULLY DEVELOPED TURBULENT CHANNEL AIRFLOW,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
W. S. Wilson.
Chesapeake Bay Institute Technical Report 74 (Reference 72-2), March 1972. 85 p, 30 fig, 4 tab, 37 ref. NR 083-016. ONR Contract N00014-67-A-0163-0006.

Descriptors: *Waves (Water), *Wave pile-up, *Channel flow, *Turbulence, *Hydraulic models, Wind velocity, Air circulation, Analytical techniques, Mathematical studies, Theoretical analysis, Correlation analysis, Air-water interfaces, Surface waters.
Identifiers: *Wave growth rates, Airflow.

An experimental study was conducted to measure the growth rates of mechanically generated surface water waves when subjected to fully developed turbulent channel airflow. For a series of wave frequencies from 2 to 6 Hz at 0.5-Hz increments and centerline velocities of 0.20, 1.12, and 1.84 m/s (meters per second), wave amplitudes were measured at three stations, 2.21, 3.43, and 4.65 meters downwind from the wave generator. In addition, for centerline velocities of 1.12 and 1.84 m/s, Ul (the velocity at the outer edge of the viscous sublayer) and U* (the shear velocity) were obtained from measured mean velocity and Reynolds stress profiles. The wave amplitude measurements at the wind velocity of 0.20 m/s provided attenuation rate estimates which agreed with theoretical attenuation rates based on viscous effects both on the walls and in the bulk of the water. The amplitude measurements at the wind velocities of 1.12 and 1.84 m/s provided growth rate estimates which were compared with theoretical growth rates (computed using the wage frequency, Ul and U*) predicted by the Mile's 1962 Theory. At 1.12 m/s Mile's growth rates were two to five times larger than those measured; at 1.84 m/s, Mile's growth rates were about two times larger. (Woodard-USGS)
W72-13734

SELECTED STREAMFLOW CHARACTERISTICS AS RELATED TO CHANNEL GEOMETRY OF PERENNIAL STREAMS IN COLORADO,
Geological Survey, Lakewood, Colo.
E. R. Hedman, D. O. Moore, and R. K. Livingston.
Geological Survey Open-file Report, May 1972. 14 p, 3 fig, 2 tab, 5 ref.

Descriptors: *Streamflow, *Flow characteristics, *Perennial streams, *Colorado, Channel morphology, Cross-sections, Flow rates, Discharge measurement, Stream gages, Rating curves, Streamflow forecasting, Estimating.
Identifiers: Ungaged streams.

The mean annual runoff and peak discharges having selected recurrence intervals are related to the width and average depth of cross sections between channel and point bars for 53 gaged sites on perennial streams in the mountain region of Colorado. These relations and measures of channel dimensions can be used to estimate streamflow characteristics for ungaged streams in the Colorado mountain region. The standard error of estimate is 18.3% for the relation with mean annual runoff, and ranges from about 30% to 45% for the relations with peak discharges having recurrence intervals of 2, 5, 10, 25, and 50 years. The standard error of estimate generally increased with the recurrence interval for peak discharges. (Woodard-USGS)
W72-13736

EVALUATION OF A DETERMINISTIC MODEL FOR PREDICTING WATER YIELDS FROM SMALL AGRICULTURAL WATERSHEDS IN VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Research Div.
For primary bibliographic entry see Field 02A.
W72-13824

SURFACE WATER SUPPLY OF THE UNITED STATES, 1961-65, PART 1. NORTH ATLANTIC SLOPE BASINS--VOLUME 2. BASINS FROM NEW YORK TO DELAWARE.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-13827

FLOOD PLAIN INFORMATION, TALKEETNA RIVER-SUSITNA RIVER-CHULITNA RIVER, TALKEETNA, ALASKA.
Corps of Engineers, Anchorage, Alaska.
For primary bibliographic entry see Field 04A.
W72-13836

CHANNEL NETWORK OF A BASIN AND FORMATION OF RUNOFF (RUSLOVAYA SET' BASSEYNA I PROTSESS FORMIROVANIYA STOKA VODY),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
R. A. Nezhikhovskiy.
Gidrometeoizdat, Leningrad, 1971. 476 p.

Descriptors: *Runoff, *Flow, *Channel flow, *Channels, *River basins, Watersheds (Basins), Drainage area, Water distribution (Applied), Water storage, Discharge (Water), Flood discharge, Flood routing, Flood flow, Flow rates, Time lag, Hydrographs, Water balance, River forecasting, Hydrography, Fluctuations.
Identifiers: *USSR, *European USSR, Hydrometric stations.

This 3-section monograph examines the channel network of a river basin and its role in the formation of flood runoff. Section I (Chapter I-V) provides information on the hydrographic network of a basin (including stream density, composition, and structure) and on the calculation of channel storage and storage changes. The contribution of channels to flood runoff, including the volume and distribution of water and channel inflow, is described in the second section (Chapters VI-IX). River-forecasting procedures based on these parameters are outlined in the final section (Chapters X-XI). (Josefson-USGS)
W72-13853

HYDROLOGIC INVESTIGATIONS, COMPUTATIONS, AND FORECASTS (VOPROSY GIDROLOGICHESKIKH ISSLEDOVANIY, RASCHETOV I PROGNOZOV).
For primary bibliographic entry see Field 04A.
W72-13854

FORMATION, CALCULATION, AND REGULATION OF STREAMFLOW (FORMIROVANIYE, RASCHETY I REGULIROVANIYE RECHNOGO STOKA).
For primary bibliographic entry see Field 04A.
W72-13857

PROBLEMS IN HYDROLOGIC INSTRUMENTATION (VOPROSY GIDROLOGICHESKOGO PRIBOROSTROYENIYA).
For primary bibliographic entry see Field 07B.
W72-13859

TECHNIQUES AND HYDRULIC VERIFICATION OF HYDROMETRIC STUDIES (METODIKA I GIDRAVLICHESKOYE OBOSNOVANIYE GIDROMETRICHESKIKH RABOT).
For primary bibliographic entry see Field 08B.
W72-13861

DYNAMICS OF FLOOD FREQUENCY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
P. S. Eagleson.
Water Resources Research, Vol 8, No 4, p 878-898, August 1972. 14 fig, 2 tab, 16 ref. OWRR C-2137 (No 3403) (3).

Descriptors: *Floods, *Frequency analysis, *Flood recurrence interval, *Probability, Numerical analysis, *Connecticut, Statistical methods, Peak discharge, Land use.
Identifiers: Kinematic wave theory.

The probability mass function of peak streamflow is derived from the density functions for climatic and catchment variables by the kinematic wave method of hydrograph forecasting. The exceedance probability for a flood peak is then related to the annual exceedance recurrence interval. The resulting theoretical flood frequency relation shows a changing form with change in catchment and climate parameters and agrees well with observations from three Connecticut catchments. It provides a theoretical basis for estimating flood frequency in the absence of streamflow records and for extrapolating empirical estimates based on short records. Because of explicit, physically meaningful catchment parameters, it also allows quantitative estimates of the effect on flood frequency of changes in land use. The flood frequency relation is averaged across the population of catchments of given size to provide a theoretical regional flood frequency function that compares favorably with observations of mean annual floods on 44 Connecticut catchments. (Knapp-USGS)

W72-14003

STREAMFLOW SYNTHESIS -- A CASE STUDY,
Nevada Univ., Reno. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-14005

CALIFORNIA HIGH WATER, 1969-1970,
California State Dept. of Water Resources, Sacramento.
W. A. Arvola, D. E. Martfeld, W. B. Chan, J. C. Bringham, and G. W. Patrick.
California Department of Water Resources Bulletin No 69-70, August 1971. 50 p, 19 plate, 3 tab.

Descriptors: *Floods, *Flood damage, *Flood data, *California, Flood peak, Streamflow, Rainfall-runoff relationships, Mudflows, Reservoirs, Storms, Hydrologic data, Data collections.

Most of the precipitation in California during the 1969-70 water year fell in December 1969 and January 1970. Above-normal January rainfall affected the northern half of the State with many stations reporting two to three times the normal for the month. Precipitation totals for the 3-day period of January 21-23 were especially heavy causing runoff in the North Coast streams from 400 to 600% above normal. January precipitation in the Sacramento Valley ranged from 200 to 350% above normal causing peaks of record at several locations along the Sacramento River. Runoff in the Sacramento Valley ranged from 500% above normal on the Sacramento River to 600% on the Feather and Yuba Rivers. Inflow into Shasta Lake peaked near 210,000 cfs, the highest inflow of record. Releases from Keswick Dam were increased to 79,000 cfs, the maximum allowable under flood control regulations, for the first time since 1958. The Governor proclaimed 17 counties disaster areas. (Woodard-USGS)
W72-14013

RIVER DISCHARGE INTO AN ICE-COVERED OCEAN AND RELATED SEDIMENT DISPERSAL, BEAUFORT SEA, COAST OF ALASKA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02J.
W72-14020

LONGITUDINAL PROFILES OF EPHEMERAL STREAMS IN SOUTHEASTERN ARIZONA,
Princeton Univ., N.J. Dept. of Geological Sciences.
D. S. Cherkauer.
Geological Society of America Bulletin, Vol 83, No 3, p 353-365, February 1972. 7 fig, 6 tab, 20 ref.

Descriptors: *Geomorphology, *Profiles, *Channel morphology, *Ephemeral streams, *Arizona, Terrain analysis, Erosion, Bed load, Particle size, Roughness (Hydraulic), Topography, Graded, Sediment load, Geologic control, Statistical methods.
Identifiers: *Stream profiles.

Longitudinal profiles in ephemeral streams heading in the mountains of southeastern Arizona are related to the longitudinal variation of drainage area, bed-material size, and channel width to depth ratio. These parameters are related to discharge, sediment load, and roughness, which have been found to control stream profiles in other regions, but were unavailable for this ephemeral-stream study. Inclusion of basin relief and lithology allowed development of statistically significant equations for both segments of streams draining granitic and sedimentary terrains. Profiles of streams in two additional mountain ranges were predicted from the equations with an accuracy within the limits of accuracy of the field and map measurements. Precipitation-elevation relations have no apparent effect on the accuracy of the predictions or on stream-profile concavity. (Knapp-USGS)

W72-14021

ALLUVIAL CUTOFF DATING FROM SUBSEQUENT GROWTH OF A MEANDER,
Iowa State Univ., Ames. Engineering Research Inst.
For primary bibliographic entry see Field 02J.
W72-14025

REDUCTION OF RUNOFF INTO KARA-BOGAZ-GOL AND THE FUTURE LEVEL OF THE CASPIAN SEA (OGRANICHENIYE STOKA V ZALIV KARA-BOGAZ-GOL I BUDUSHCHIY UROVEN' KASPIYSKOGO MORYA),
Gidrometeorologicheskii Nauchno-Issledovatelskii Tsentr, Leningrad (USSR).
K. I. Smirnova.
Meteorologiya i Gidrologiya, No 12, p 65-70, December 1971. 3 fig, 3 tab, 6 ref.

Descriptors: *Runoff, *Streamflow, *Sea level, *Water levels, Water level fluctuations, Water balance, Inflow, Alteration of flow, Diversion, Regulation, Dam construction, Damsites, Probability, Forecasting.
Identifiers: *USSR, *Caspian Sea, *Kara-Bogaz-Gol.

Water from the Caspian Sea flows into the large shallow gulf of Kara-Bogaz-Gol on the coast of the Turkmen Republic through a narrow strait. The depth of the strait is 4.5-6.5 m, and the average rate of flow in the strait is 1.0-1.5 m/sec. Calculations indicate that by the year 2000 the water level of the Caspian Sea could rise 25 cm by limiting runoff into the gulf to 5 cu km/yr and by increasing inflow of water to the sea. The water level could be increased an additional 5 cm during the same period by diversion of the runoff of northern rivers to the Volga basin. Construction of a dam across the strait of Kara-Bogaz-Gol would have little positive effect on raising the sea level. (Josefson-USGS)
W72-14032

HYDROLOGIC COMPUTATIONS AND FORECASTS (VOPROSY GIDROLOGICHESKIKH RASCHETOV I PROGNOZOV).
For primary bibliographic entry see Field 04A.
W72-14038

HYDRODYNAMICS OF FREE-BOUNDARY FLOWS,
For primary bibliographic entry see Field 08B.
W72-14040

HYDROGEOLOGICAL STUDIES IN THE CAPTATION AREA OF THE LOISACH RIVER BETWEEN GARMISCH-PARTENKIRCHEN AND ESCHENLOHE/OBB,
Bayerische Akademie der Wissenschaften, Munich (West Germany).
Jan-Peter Wrobel.
Bayer Akad Der Wiss Math Naturwiss Kl Abh. 146: 1-87. Illus. Maps. 1970.
Identifiers: *Captation area, Eschenlohe, Garmisch-Partenkirchen, Germany, *Loisach River, Minerals, Obb, Rivers, *Hydrogeology.

The hydrological connection between mountain chains partly converted to karst and the Loisach valley, the hydraulic connection between the main drainage channel and ground water, and the water balance in the Loisach basin between Garmisch Partenkirchen and Eschenlohe Obb were studied by analyzing the geology and stratigraphy of the area and by using dyes (uranine, sulf-rhodamine-extra-G) to race the subterranean movements of water. Traces of dyes were absorbed by bags containing activated charcoal and the eluate examined by a fluorometer. Four types of springs draining into the Loisach with water of different mineral content stemming from their different subterranean routes were identified. An equilibrium existed between the river and ground water and at certain times the Loisach gave up water to the ground water reservoir. Two types of ground water, one containing calcium carbonate, the other calcium sulfate were identified.--Copyright 1972, Biological Abstracts, Inc.
W72-14148

MECHANICAL BALANCE: ELECTRICAL READOUT WEIGHING LYSIMETER,
Atmospheric Environment Service, Toronto (Ontario).
For primary bibliographic entry see Field 07B.
W72-14185

2F. Groundwater

GROUND WATER IN KEARNY COUNTY, SOUTHWESTERN KANSAS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-13715

GROUND-WATER RESOURCES OF MCLEAN COUNTY, WEST-CENTRAL NORTH DAKOTA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-13716

WATER-QUALITY RECONNAISANCE OF THE LOWER SANTA ANA RIVER CANYON, SOUTHERN CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02K.
W72-13720

REVIEW OF GEOHYDROLOGICAL ACTIVITIES IN THE NETHERLANDS SINCE WORLD WAR II, IN PARTICULAR OF THE GOVERNMENT INSTITUTE FOR WATER SUPPLY,
Rijksinstituut voor Drinkwatervoorziening, The Hague (Netherlands).
E. Romijn.
Geologie en Mijnbouw (Netherlands), Vol 51, No 1, p 1-6, 1972. 40 ref.

Descriptors: *Reviews, *Hydrogeology, Water conservation, Water management (Applied), Drainage, Water supply.
Identifiers: *Netherlands.

Geohydrological activities in the Netherlands since World War II are reviewed. Besides the Government Institute for Water Supply many other agencies and institutes have contributed to progress. Scientific achievements in geohydrology have largely run parallel with the rapid social and economic development of the Netherlands since the war. (Knapp-USGS)
W72-13721

BURIED CHANNEL AQUIFERS AND PRESENT OPEN DRAINAGE SYSTEM OF EAST GELDERLAND, THE NETHERLANDS,
Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences.
J. J. De Vries, and E. Van Rees Vellinga.
Geologie en Mijnbouw, (Netherlands), Vol 51, No 1, p 45-52, 1972. 5 fig, 16 ref.

Descriptors: *Aquifers, *Alluvial channels, *Drainage patterns (Geologic), Pleistocene epoch, Paleohydrology, Hydrogeology, Glacial drift, Stratigraphy.
Identifiers: *Buried valleys, *East Gelderland (The Netherlands).

In the eastern part of the province of Gelderland, The Netherlands, two buried valley systems have

been traced. One system is filled with fluvioglacial deposits dating from the Saalian Ice Age, the other with preglacial fluvial sediments which are remarkably rich in volcanic minerals. Both systems have courses almost perpendicular to the present drainage system. This change in stream direction is explained by postglacial replacement of the main drainage channel in the area, tectonic movement perpendicular to the old channels, and postglacial filling of the old channels with wind blown sand. (Knapp-USGS)
W72-13722

GEOHYDROLOGICAL INVESTIGATIONS WITH A VIEW TO GROUNDWATER CATCHMENT--A CASE HISTORY,
Rijksinstituut voor Drinkwatervoorziening, The Hague (Netherlands).
For primary bibliographic entry see Field 04B.
W72-13723

CONTRIBUTION TO THE GEOCHEMISTRY OF GROUNDWATER IN NORTHERN GERMANY,
Geologisches Landesamt Hamburg (West Germany).
For primary bibliographic entry see Field 02K.
W72-13725

THE USE OF GEOHYDROLOGY IN SOLVING WATER MANAGEMENT PROBLEMS IN AGRICULTURE,
Institute for Land and Water Management Research Wageningen (Netherlands).
For primary bibliographic entry see Field 04B.
W72-13726

RECENT DEVELOPMENTS OF PHYSICAL INVESTIGATIONS IN BOREHOLES AND WELLS,
Waterloopkundig Laboratorium, Delft (Netherlands).
For primary bibliographic entry see Field 04B.
W72-13727

APPLICATION OF NATURAL ISOTOPES IN GROUND WATER HYDROLOGY,
Groningen Rijksuniversiteit (Netherlands). Physics Lab.
W. G. Mook.
Geologie en Mijnbouw (Netherlands), Vol 51, No 1, p 131-136, 1972. 16 ref.

Descriptors: *Reviews, *Radioisotopes, *Stable isotopes, *Tracers, *Hydrogeology, Tritium, Deuterium, Oxygen, Carbon radioisotopes, Evaporation, Water balance, Groundwater movement.

The naturally abundant isotopes of carbon, oxygen and hydrogen all have their specific contribution to groundwater research. Their best use is to serve as ideal tracers, especially 0-18, deuterium and tritium, which are materials of the water molecule itself. They are largely used to determine the origin of groundwater. The radioactive isotopes, C-14 and T, have a special use, that of dating water. By comparing the ages of samples within a water body, a flow direction and velocity may be deduced. Deuterium and C-13 can reveal more specific information on the degree of evaporation before or during infiltration and the occurrence of hydrologic and chemical processes in the unsaturated zone. (Knapp-USGS)
W72-13728

AN ELECTRONIC GROUNDWATER-LEVEL DETECTOR WITH AUTOMATIC OUTPUT REGISTRATION,
Koninklijke-Shell Exploratie en Produktie Laboratorium, Rijswijk (Netherlands). An Electronic Groundwater-Level Detector with Automatic Output Registration,
For primary bibliographic entry see Field 07B.
W72-13729

PERMEABILITY DISTRIBUTION IN A HOLOCENE DISTRIBUTARY CHANNEL-FILL NEAR LEERDAM (THE NETHERLANDS),
Koninklijke-Shell Exploratie en Produktie Laboratorium, Rijswijk (Netherlands).
For primary bibliographic entry see Field 02J.
W72-13730

APPLICATION OF MODELS IN GEOHYDROLOGICAL INVESTIGATIONS,
Koninklijke Nederlandsche Heidemaatschappij, Arnhem (Netherlands).
For primary bibliographic entry see Field 02A.
W72-13731

TEST-OBSERVATION WELL NEAR DAVENPORT, WASHINGTON: DESCRIPTION AND PRELIMINARY RESULTS,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 04B.
W72-13733

ELECTRIC ANALOG STUDIES OF FLOW TO WELLS IN THE PUNJAB AQUIFER OF WEST PAKISTAN,
Geological Survey, Washington, D.C.
M. J. Mundorff, G. D. Bennett, and M. Ahmad.
Available from GPO, Washington, DC 20402-Price 65 cents. Geological Survey Water-Supply Paper 1608-N, 1972. 28 p, 12 fig, 1 plate, 6 tab, 5 ref.

Descriptors: *Groundwater movement, *Aquifer characteristics, *Flow characteristics, *Analog models, *Water wells, Test wells, Pumping, Permeability, Drawdown, Flow rates, Foreign research.
Identifiers: *West Pakistan, *Punjab aquifer (Wext Pakistan), Model Design, Time of travel (Groundwater).

A series of experiments was performed with a steady-state electric analog simulating a cylindrical segment of the aquifer underlying the plains of the Punjab region of West Pakistan. Experiments were made with different anisotropies (ratios of lateral to vertical resistance) so that various possible combinations of aquifer thickness and effective radius or radius of influence and combinations of lateral and vertical permeability could be included in the models. Flow nets were constructed to show distribution of potential in the vertical section and intersections of stream surfaces with the vertical plane. Under conditions prevalent in the Punjab, the distance-drawdown method for determining permeability gives results with an error of 10% or less provided that at least one piezometer or observation well is within a few feet of the pumped well and that no observation well or piezometer used is more than 100 feet from the pumped well. Relative traveltime for each of 10 stream tubes is given for three models. Relative traveltimes for one-fourth and one-half the effective radius are given for selected stream tubes. By substituting values for the aquifer parameters, actual traveltimes are computed from the relative-traveltime data. (Woodard-USGS)
W72-13735

NONSTEADY FLOW IN A RECHARGE WELL--UNCONFINED AQUIFER SYSTEM,
California Univ., Los Angeles.
M. A. Marino, and W. W. G. Yeh.
Journal of Hydrology, Vol 16, No 2, p 159-176, June 1972. 9 fig, 1 tab, 21 ref.

Descriptors: *Unsteady flow, *Injection wells, *Groundwater movement, *Mathematical studies, *Recharge wells, Dupuit-Forchheimer theory, Hydrogeology, Hydraulic conductivity, Artificial recharge, Numerical analysis, Model studies, Mathematical models, Dimensional analysis.

A recharge well-unconfined aquifer system is considered in which the well completely penetrates a homogeneous, isotropic, extensive aquifer. The system is characterized also by nonuniformity of the recharge rate, constancy of the injection head, hydraulic conductivity, and specific yield of the aquifer, and the validity of the Dupuit-Forchheimer assumptions. Dimensional analysis and similarity approximation are used to transform the governing second-order, nonlinear, partial differential equation into a second-order, nonlinear, ordinary differential equation. The differential equation is solved by coupling the fourth-order Runge-Kutta method with the Lagrange interpolation method. The method is inherently stable for any times. Dimensionless graphical solutions of water table profiles at different times are presented for various conditions. A closed-form analytical solution based on the linearized equation is developed that closely approximates the flow system under consideration. Dimensionless graphical solutions for volume and average rate of recharge are presented for conditions commonly encountered in practice. The dimensionless form of the solutions makes possible their application to any well-aquifer system with similar characteristics regardless of the values of the hydraulic properties of the aquifer. (Knapp-USGS)
W72-13828

GENERAL GROUND-WATER QUALITY IN FRESH-WATER AQUIFERS OF DELAWARE,
Delaware Geological Survey, Newark.
For primary bibliographic entry see Field 05B.
W72-13832

GEOLOGY AND GROUND WATER, UNIVERSITY OF DELAWARE, NEWARK, DELAWARE,
Delaware Geological Survey, Newark.
For primary bibliographic entry see Field 04B.
W72-13833

NITRATE CONTAMINATION OF THE WATER--TABLE AQUIFER IN DELAWARE,
Delaware Geological Survey, Newark.
For primary bibliographic entry see Field 05B.
W72-13834

GROUND-WATER GEOLOGY OF THE DELAWARE ATLANTIC SEASHORE,
Delaware Geological Survey, Newark.
J. C. Miller.
Delaware Geological Survey Report of Investigations No 17, August 1971. 33 p, 4 fig, 5 tab, 24 ref.

Descriptors: *Groundwater resources, *Seashores, *Delaware, Hydrogeology, Water demand, Water resources development, Water supply, Water utilization, Water wells, Aquifers, Water yield, Transmissivity, Specific capacity, Water quality, Chemical analysis, Drawdown, Saline water intrustion, Recreation facilities, Planning, Projections.

A new geologic interpretation of occurrence of deep aquifers in the Delaware Atlantic seashore area is presented. Recent data from deep wells has enabled the construction of a more accurate geologic framework upon which the hydrologic data are superimposed. Correlation of Miocene sands concludes that the Manokin aquifer lies at greater depths in southeastern Delaware than previously thought. Present water use is approximately 4 mgpd (million gallons per day) and will reach 9.3 mgpd by the year 2000. Moderately high transmissibility values (54,5000 gpd/ft) and specific capacities (average of 11.7 gpm/ft of drawdown) for the Pocomoke aquifer indicate that further development is possible. The Manokin aquifer has a transmissibility of only 29,250 gpd, but greater drawdowns are available. With proper well spacing and development approximately 10 to 8 mgpd are available from the Pocomoke and Manokin aquifers, respectively. The Columbia

(Pleistocene) aquifer will yield 5.2 mgpd from the headlands south of Lewes and 4.5 mgpd west of Ocean View-Millville. (Woodard-USGS)
W72-13835

GROUND-WATER OUTFLOW FROM CHINO BASIN, UPPER SANTA ANA VALLEY, SOUTHERN CALIFORNIA,
Geological Survey, Washington, D.C.
J. J. French.
Available from Sup Doc, GPO, Washington, DC 20402-Price $0.25. Geological Survey Water-Supply Paper 1999-G, 1972. 28 p, 7 fig, 1 plate, 3 tab, 30 ref.

Descriptors: *Groundwater movement, *Aquifer characteristics, *Discharge (Water), *Mathematical studies, *California, Water yield, Equations, Hydrologic data, Permeability, Sediments, Hydraulic gradient, Water levels, Water wells, Water table, Test wells, Specific capacity.
Identifiers: *Chino Basin (Calif).

Groundwater outflow from Chino basin in Southern California, was calculated by a direct method using the equation Q=PIA, in which Q is the quantity of groundwater outflow, P is the average coefficient of permeability of the sediments through which the flow occurs, I is the average hydraulic gradient, and A is the cross-sectional area of the sediments through which the flow occurs. The period selected for the calculation was 1930-66. Permeability of the water-bearing sediments was calculated from aquifer-test data and from computations involving specific-capacity data from 200 wells in the outflow area. Permeability ranged from less than 100 to more than 5,000 gallons per day square foot. The annual hydraulic gradient was derived from contour maps of average water levels in wells. Gravity and seismic traverses, drill-hole logs, and data from more than 600 drill holes, including eight test holds, were used to delineate the size and the shape of the outflow area. The total area of the outflow section varied from about 16 to 22 million square feet. The fluctuation in total area is caused by changes in the altitude of the water table. Annual groundwater outflow from Chino basin calculated by the direct method for the period 1930-66 ranged from 35,000 acre-feet in the 1941 water year to 9,400 acre-feet in the 1966 water year. (Woodard-USGS)
W72-13838

SEA WATER INTRUSION: MORRO BAY AREA, SAN LUIS OBISPO COUNTY,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 02L.
W72-13846

GROUND-WATER OCCURRENCE IN THE MARYLAND PIEDMONT,
Geological Survey, Parkville, Md.
L. J. Nutter, and E. G. Otton.
Maryland Geological Survey Report of Investigations No 10, 1969. 56 p, 27 fig, 1 plate, 9 tab, 47 ref, append.

Descriptors: *Groundwater resources, *Water wells, *Aquifer characteristics, *Water supply, *Maryland, Crystalline rocks, Hydrogeology, Groundwater movement, Pumping, Water yield, Aquifer testing, Groundwater recharge, Storage coefficient, Water level fluctuations, Well data, Logging (Recording), Water utilization, Hydrologic data.
Identifiers: *Maryland (Piedmont Province).

Factors governing the occurrence of groundwater in the crystalline rocks of the Maryland Piedmont are complex and variable. The crystalline rocks consist of schist, gneiss, granite, quartzite, marble, metagabbro, and other rock types of lesser importance. EFFECTIVE GROUNDWATER RECHARGE IS ABOUT 11 INCHES PER YEAR, OR ABOUT 500,000 GPD. Much of the groundwater is stored in the weathered zone (saprolite), having an average thickness of about 45 feet. Based on an analysis of more than 1,300 well records, little significant difference was observed for the yield of wells in different rock types, although, based on mean yields, wells in marble are the most productive. The mean yield of all wells is about 9 gpm and the mean specific capacity is 0.6 gpm per ft of drawdown. Most of these wells were drilled for domestic use. Coefficients of transmissibility range from less than 100 to 35,000 gpd per ft, but commonly are in the range of 2,000 to 7,000 gpd per ft. Coefficients of storage range from 0.002 to 0.05. However, the long-term gravity yield of the regolith (the zone contributing to the base flow of streams) is about 8%. A map shows the extreme areal variability of the yield of wells. (Woodard-USGS)
W72-13848

INVESTIGATIONS OF ORGANIC MATTER IN GROUNDWATER OF OIL- AND GAS-BEARING REGIONS (METODICHESKIYE ISSLEDOVANIYA V OBLASTI IZUCHENIYA ORGANICHESKOGO VESHCHESTVA PODZEMNYKH VOD NEFTEGAZONOSNYKH OBLASTEY),
For primary bibliographic entry see Field 05B.
W72-13856

DIGITAL COMPUTER MODELING OF LIMESTONE GROUNDWATER SYSTEMS,
Kentucky Water Resources Inst., Lexington.
J. Thrailkill, and D. P. Beiter.
Available from the National Technical Information Service as PB-212 054, $3.00 in paper copy, $0.95 in microfiche. Report No 50, 1972. 71 p, 10 fig, 7 tab, 13 ref, append. OWRR A-030-KY (1).

Descriptors: *Groundwater movement, *Aquifer characteristics, *Limestones, *Computer models, Digital computers, Computer programs, Analytical techniques, Laminar flow, Turbulent flow, Numerical analysis, Data collections, Correlation analysis.

Because limestone groundwater flows mainly in discrete openings, limestone aquifers are fundamentally different from aquifers in granular rocks. A digital computer program which simulates flow in a limestone aquifer as a pipe network was written and compared with the Sinkhole Plain aquifer of west-central Kentucky. A reasonably good fit between observed parameters of the aquifer and those calculated were obtained under assumed conditions of both laminar and turbulent flow in the aquifer. The indicated gross permeability of the aquifer is 5600 meinzers with an assumed aquifer thickness of 100 feet. The location and discharge of springs along the streams bounding the aquifer are predicted. (Woodard-USGS)
W72-14001

CARBONATE CHEMISTRY OF AQUIFER AND STREAM WATER IN KENTUCKY,
Kentucky Univ., Lexington. Dept. of Geology.
J. Thrailkill.
Journal of Hydrology, Vol 16, No 2, p 93-104, June 1972. 3 fig, 2 tab, 34 ref. OWRR A-009-KY (2).

Descriptors: *Water chemistry, *Karst hydrology, *Limestones, *Dolomite, *Kentucky, Leaching, Karst, Saturation, Carbon dioxide, Solubility, Geochemistry, Recharge, Infiltration, Surface-groundwater relationships.

The principal circulation of the limestone aquifer underlying the Sinkhole Plain of Kentucky is undersaturated with respect to calcite. Two sinking streams which recharge the aquifer are also undersaturated. The smaller stream is much more undersaturated than the larger, but at any one time the equilibrium carbon dioxide pressure of the two streams is the same. The carbon dioxide pressure of the aquifer is higher than that of the recharging streams, and the higher calcium content of the aquifer water indicates solution of limestone is occuring by the introduction of carbon dioxide into the aquifer. At a single site, saturation with respect to calcite varied considerably, with changes apparently related more to discharge than to temperature or season (large undersaturation associated with high flow volumes). Saturation of the streams and aquifer with respect to dolomite was similar to that with respect to calcite, but the waters were always more undersaturated with respect to dolomite by an approximately constant amount. (Knapp-USGS)
W72-14004

THE GENESIS OF SELECTED HYDROCHEMICAL FACIES IN BATON ROUGE, LOUISIANA, GROUND WATERS,
Louisiana State Univ., Baton Rouge. Dept. of Geology.
R. A. Khan, R. E. Ferrell, and G. K. Billings.
Ground Water, Vol 10, No 4, p 14-20, July-August 1972. 4 fig, 2 tab, 17 ref. OWRR A-010-LA (3).

Descriptors: *Water chemistry, *Hydrogeology, *Louisiana, *Bicarbonates, Ion exchange, Leaching, Geochemistry, Aquifer characteristics, Sampling, Water analysis, Sodium, Calcium, Magnesium.
Identifiers: *Baton Rouge (La).

Bicarbonate-rich groundwaters are present beneath Baton Rouge, Louisiana. They may be subdivided into two subtypes based on the dominant cation. Many groundwaters are Na-rich, the others are Ca and Mg-dominant bicarbonate waters. Na/Ca and Na/Mg epm ratios in the Na-rich subfacies are 126-394 and 347-1649, respectively. The corresponding ratios in the Ca + Mg-dominant subfacies are 0.14-0.58 and 0.17-0.58. The HCO3 concentration varies from 77 to 412 ppm and the total dissolved solids content is usually lower than 500 ppm. Multiple regression analyses of the ion distributions and calculated correlation coefficients for ion associations help quantify the distribution of the dissolved species and help to define the proposed mechanisms for genesis of the groundwaters. Ion exchange, selective filtration of dissolved constituents, and mixing of surface waters in the aquifers are the primary mechanisms controlling the chemical composition of the groundwaters. The occurrence of the Na-HCO3 facies at shallow levels in the area of maximum offtake is attributed to the accelerated ion filtration accompanying the high rate of groundwater withdrawal. (Knapp-USGS)
W72-14008

GROUNDWATER RESOURCES OF SALINE COUNTY, MISSOURI,
Geological Survey, Rolla, Mo. Water Resources Div.
J. C. Miller.
Missouri Geological Survey and Water Resources, Water Resources Report 26, 1971. 75 p, 8 fig, 8 tab, 30 ref, append.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water quality, *Water wells, *Missouri, Hydrologic data, Basic data collections, Geology, Hydrogeology, Salinity, Hydrogen sulfide, Chemical analysis, Well data.
Identifiers: *Saline County (Mo).

Saline County, Missouri, straddles the transition of the fresh groundwater of the Ozarks to the saline groundwater of northwest Missouri. Paleozoic sedimentary rocks have been deformed by a series of northwest-trending anticlines and normal faults. Variations in groundwater quality are correlated with thickness of Pennsylvanian

shales overlying the Paleozoic carbonate rocks, depth of wells, local geologic structure, and biochemical activity. Sulfo-saline groundwater in Saline County often contains offensive amounts of hydrogen sulfide gas and ranges in salinity from 100 to 37,000 parts per million total dissolved solids. The distribution of sulfo-saline groundwater has a definite pattern controlled by geologic processes and structure. The saline groundwater may be best described as a connate water which probably had its origin either by entrapment of seawater by marine sediments or by shale membrane filtration of more dilute waters. Nine water quality areas are outlined on a water quality map and recommendations for obtaining potable water supplies are made where possible. (Woodard-USGS)
W72-14011

MORPHOMETRIC ANALYSIS OF POLYGONAL KARST IN NEW GUINEA,
Trinity Coll., Dublin (Ireland).
For primary bibliographic entry see Field 02J.
W72-14018

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1972,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 04B.
W72-14023

RECORDS OF WELLS IN HARRIS COUNTY, TEXAS, 1892-1972,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 04B.
W72-14027

DEVELOPMENT OF GROUND WATER IN THE EL PASO DISTRICT, TEXAS, 1963-70,
Geological Survey, El Paso, Tex.
W. R. Meyer, and J. D. Gordon.
Texas Water Development Board Report 153, August 1972. 50 p, 17 fig, 7 tab, 10 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water wells, *Water supply, *Texas, Withdrawal, Pumping, Water yield, Water utilization, Groundwater recharge, Water quality, Dissolved solids, Salinity, Water level fluctuations, Hydrologic data, Data collections, Hydrologic budget, Water resources development.
Identifiers: *El Paso (Tex).

Development of groundwater in the El Paso district continued to increase from 1963 to 1970, but at a less rapid rate than in previous years. During this period, 82 wells were drilled. In 1963 the pumpage from deep wells was 78.3 mgd (million gallons per day); pumpage in 1969 was 90.2 mgd. The amount of water pumped for irrigation ranged from 159.3 mgd in 1964 to 14.3 mgd in 1969. Approximately 7,500,000 acre-feet of fresh water is stored in the sediments in the bolson area, of which 6,800,00 acre-feet is in the mesa part of the bolson and 700,000 acre-feet is in the city artesian area. An estimated 3,400,000 acre-feet of slightly saline water, 1,000 mg/liter to 3,000 mg/liter dissolved solids, is stored in the bolson deposits that adjoin and underlie the fresh-water zone. This water can be blended with fresh water to produce water that is suitable for public supply. The amount of fresh water available (560,000 ac-ft) in the upper valley has remained essentially unchanged, because the rate of withdrawal is approximately equal to the rate of natural recharge (13.0 mgd).
W72-14029

DELAYED YIELD AND UNSATURATED FLOW ABOVE A FALLING WATER TABLE,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 02G.
W72-14052

UNSTEADY FLOW OF GROUND WATER,
Wisconsin Univ., Madison. Water Resources Center.
P. L. Monkmeyer, J. A. Hoopes, W. A. Murray, J. A. Spooner, and C. S. Tong.
Available from the National Technical Information Service as PB-212 031, $3.00 in paper copy, $0.95 in microfiche. Wisconsin Water Resources Center, Madison, Completion Report, June 1972. 95 p, 15 tab, 41 fig, 10 ref. OWRR B-021-WIS (4).

Descriptors: Aquifer characteristics, Aquifers, Capillary conductivity, Dispersion, Drawdown, Groundwater, Permeability, Saline water-fresh water interfaces, Sea water intrusion, Sound waves, Specific yield, Water table, Zone of saturation.
Identifiers: Delayed yield, Seepage face.

The effects of the seepage face and delayed yield on the location of the free surface in unsteady unconfined groundwater flow have been studied theoretically and experimentally. The seepage face was found to decay exponentially with time for instantaneous drawdown and to affect free surface locations significantly near the outflow face. A simple numerical method has been developed for predicting the quantity and duration of delayed drainage to a falling water table. The possibility of using sound waves for the field determination of hydraulic conductivity has been investigated by propagating impulse type pressure waves through saturated, partly saturated, and air dry sand columns. The theoretical solution (including linear inertial terms) shows good comparison with experiments except for the saturated case. Solutions for the concentration distribution of a dissolved substance introduced into steady, one-dimensional flow through layers of sand have been obtained and experimentally confirmed. Sea-water intrusion into layered coastal aquifers was then considered. A numerical solution predicting the effects of tidal motion, dispersion, density differences, and fresh water flow on the salinity and flow patterns was found to be in good agreement with experimental studies.
W72-14053

TRANSFORMATION OF THE TENSOR FORM OF DARCY'S LAW IN INHOMOGENEOUS AND ANISOTROPIC SOILS,
Nevada Univ., Reno. Center for Water Resources Research; and Nevada Univ., Reno. Desert Research Inst.
C. M. Case, and G. F. Cochran.
Water Resources Research, Vol. 8, No. 3, p 728-733, June 1972. 3 fig, 8 ref.

Descriptors: *Darcy's Law, *Anisotropy, *Groundwater movement, Gradient, Permeability, Soils.
Identifiers: *Tensor form, *Arbitrary cartesian coordinate system, Matrix equations, Ellipse.

The transformation of the tensor form of Darcy's law from an arbitrary cartesian coordinate system to one in which the permeability tensor is diagonal is discussed. Matrix equations are developed that allow this transformation to be conveniently performed. This transformation leads in a natural way to a discussion of the ellipses of permeability, which have been used in attempts to find geometrically the direction of the gradient of head given the velocity, and vice versa, in anisotropic media. Equations are derived that allow the magnitude, as well as the direction, of the gradient of head or velocity, as the case may be, to be found from the geometrical constructions; thus the utility of the equations is extended. Finally, the connection between the permeability ellipse and the ellipse of direction, which does not seem to have been previously noted in the literature, is demonstrated, and the implications of the connection are briefly discussed. (Clasen-Nevada)
W72-14055

2G. Water in Soils

RELATION OF PRECIPITATION TO SOIL TEMPERATURE (2ND REPORT)--EFFECT OF SOIL MOISTURE ON HEAT-EXCHANGE IN THE SOIL,
Fukushima Univ. (Japan). Dept. of Earth Science.
Y. Fukuoka.
Geographical Review of Japan, Vol 45, No 7, p 475-483, July 1972. 9 fig, 13 ref.

Descriptors: *Soil water, *Soil water movement, *Soil temperature, *Infiltration, *Heat transfer, Mass transfer, Heat balance, Heat budget, Rainfall, Heat flow, Thermal conductivity, Soil physics.
Identifiers: *Soil heat flow.

The annual amplitude of variation of soil temperature decreases exponentially with depth. Therefore, the annual heat exchange in the soil can be estimated by integrating the soil temperature amplitude from the surface to the isothermal stratum. Because the depth of the isothermal stratum is determined by the amplitude of the variation of the surface temperature, heat exchange is a function of the amplitude of the variation of the air temperature near the ground surface. However, even in regions with the same amplitude of temperature variation, the depth of the isothermal stratum does not always have the same value, because the thermal diffusivity of soil varies with soil moisture. Linear relationships were found and tabulated between heat exchange in soil and the annual amplitude of air temperature variation in soils having 4 ranges in soil moisture as measured by Lang's Regenfaktor. The simplicity of this estimation results from the fact that a variation of Lang's Regenfaktor of 20 mm/deg corresponds to variation of only 5% soil moisture. (Knapp-USGS)
W72-13845

A RADIATION MOLE FLOW-MOISTURE METER,
For primary bibliographic entry see Field 07B.
W72-13862

AMIDE-WATER INTERACTION ON MONTMORILLONITE SURFACE,
Ministry of Agriculture, Zagazig (Egypt). Soil Science Dept.
S. A. Tahoun.
United Arab Republic, Journal of Soil Science, Vol 11, No 2, p 193-203, 1971. 5 fig, 11 ref.

Descriptors: *Water chemistry, *Soil chemistry, *Surfaces, *Clays, *Montmorillonite, Chemical properties, Chemical reactions, Organic compounds, Ion exchange, Hydration, Adsorption, Alkalinity, Molecular structure, Retention, Stability, Infrared radiation, Water quality, X-ray diffraction, Competition.

Studies have been concerned with the interaction between organic and inorganic soil constituents for various theoretical and practical reasons. The objective of this work is to evaluate the relative contribution of exhangeable cations, complex bonds, hydration water, clay surfaces, adsorption sites, basicity, molecular size and retention strength to the stability of amide-clay complexes. Reaction of primary, secondary, and tertiary amides on the surface of montmorillonite was investigated by X-ray diffraction and infrared spectroscopy. The stability of the amide-clay complex depends on the nature of the bond in the complex. Water and amide molecules compete for adsorption sites on clay mineral surfaces. (Popkin-Arizona)
W72-13916

THE SOILS OF THE WOODED DISTRICT OF THE SOUTHEASTERN MORNE DEPART-

MENT: SOIL FORMATION AND GENERAL DATA ON WATER MANAGEMENT,
Institut National de la Recherche Agronomique, Paris (France).
D. Magniant, and P. Dutil.
Bull Assoc Fr Etud Sol. 6 p 3-12. 1970. Illus. Maps.
Identifiers: *Soil profiles, *Soil chemical properties, Composition, Control, Erosion, France, Water management (Applied), Marne River, Soils.

The soil types are described as to profile and chemical composition. The effect of erosion is discussed. To improve the overall drainage, control of the flow of the Marne River in this area is necessary.--Copyright 1972, Biological Abstracts, Inc.
W72-13918

EFFECT OF LAND USE PERIOD ON SOIL PROPERTIES,
Ministry of Agriculture, Cairo (Egypt); Cairo Univ., Giza (Egypt). Faculty of Agriculture; and Cairo Univ., Giza (Egypt). Dept. of Soils.
A. Fathi, M. Naga, M. F. Kandil, and M. El Abbaseri.
United Arab Republic, Journal of Soil Science, Vol 11, No 2, 1971, p 147-157. 3 tab, 3 fig, 10 ref.

Descriptors: *Effects, *Land use, *Soil properties, *Time, *Saline soils, Groundwater, Drainage, Irrigation water, Water quality, Climate, Cultivation, Arid lands, Soil texture, Water table, Soil samples, Salts, Particle size, Organic matter, Leachate, Dissolved solids, Cations, Anions, Cation exchange capacity, Sedimentation.
Identifiers: *Nile Delta, Libyan Desert.

Properties of newly cultivated land are mainly affected by physical and chemical properties of the original soil, depth of groundwater and efficiency of drainage, quality and availability of irrigation water, and prevailing climate. Soil, affected by time, is productive in proportion to new properties developed by cultivation. This work studies changes taking place when a virgin land is cultivated for different periods in the Nubaria region, Behera Governorate, between the alluvial soils of the Nile Delta within the windborne sand drifted from the Libyan Desert. The original soil is of sandy texture. The high water table results in salt accumulations at the surface due to hot weather. Soil samples were taken from seven profiles representing different periods of land use. Particle size distribution, organic matter, water extract for determinations of total soluble salts, cations and anions, cation exchange capacity, and sesquioxides were measured. Soil texture variations were due to sedimentation from irrigation water and windborne particles. Fine fractions accumulate in early cultivation then migrate down the profile, with coarse fractions decreasing. Organic matter accumulates with cultivation. Irrigation causes increase in salts, MgO. Fine fractions increase A1203 and Fe203. (Popkin-Arizona)
W72-13922

WATER AND SOME NUTRIENTS LOSSES BY DEEP PERCOLATION AS INFLUENCED BY THE DEPTH OF WATER TABLE,
Ministry of Agriculture, Cairo (Egypt). Soils Dept.
M. A. Barakat, S. I. Ghowal, and W. M. El-Ghamry.
United Arab Republic, Journal of Soil Science, Vol 11, No 1, 1971, p 47-52. 2 tab, 1 fig, 8 ref.

Descriptors: *Nutrients, *Percolation, *Water table, *Leaching, *Arid lands, Water, Humid areas, Agriculture, Saline soils, Salt balance, Soil chemistry, Irrigation practices, Nitrogen, Phosphorus, Potassium, Lysimeters, Cotton, Grain sorghum, Water loss, Nutrient removal, Irrigation water, Land reclamation.

Leaching of plant nutrients by deep percolation is a major humid region agricultural problem. A similar problem arises in arid lands where reclamation of salt affected soils requires excess water for salt removal, where leaching is required to maintain salt-soil balance, and where water tables are permanently high and irrigation is excessive and frequent. This study is concerned with nitrogen (N), phosphorus (P) and potassium (K) losses with percolated water under the later condition. Average water loss by deep percolation was found to decrease steadily with increasing depth of water table in a lysimeter experiment on cotton and maize crops where 5 depths of water tables varied from 40 to 160 cm. Water losses were 35 cm and 22 cm from water depths of 40 cm and 70 cm. Water loss was 6 cm at a water table depth of 160 cm. Average irrigation water for the whole growing season was 65 cm. Nutrient losses by deep percolation followed that of water; they were found to be 27 kg N, 88 kg K, and 135 kg K per hectare for the 40 cm water table, and 17 kg N, 55 kg K and 0.083 kg P per hectare for the 70 cm water table. Loss of K and P were greater in higher soils. (Popkin-Arizona)
W72-13923

SOIL WATER REGIME IN ECONOMIC EVALUATION OF SALINITY IN IRRIGATION,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
For primary bibliographic entry see Field 03C.
W72-13932

PERTURBATION ANALYSIS OF TWO-PHASE INFILTRATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
A. Noblanc, and H. J. Morel-Seytoux.
Proceedings, American Society of Civil Engineers, Journal of the Hydraulics Division, Vol 98, No HY9, Paper 9186, p 1527-1541, September 1972. 10 fig, 5 ref, append. OWRR B-033-COLO (10).

Descriptors: *Infiltration, *Soil water movement, *Unsaturated flow, *Capillary action, Analytical techniques, Percolation, Permeability, Hydraulic conductivity, Capillary conductivity.
Identifiers: *Perturbation analysis, *Multiphase flow.

An analytical treatment for the problem of one-dimensional infiltration into a homogeneous porous medium is presented. Movement of both the air phase and the water phase and compressibility of the air are considered. The procedure assumes that some capillary terms can be neglected in the saturation equation, whereas all capillary terms are retained in an integral equation for the unknown total flow. Infiltration rate curves are obtained for a number of situations involving different boundary or initial conditions or both. Comparisons are made with results of an earlier and simpler procedure, confirming the validity of the simpler procedure. It is recommended that the traditional unsaturated flow equation be abandoned in favor of the two-phase flow approach. (Knapp-USGS)
W72-14006

USE OF CAPILLARY COLUMNS TO STUDY INFILTRATION OF WATER INTO FROZEN SOIL (SKHEMA KAPILLYARNYKH KOLONN DLYA VPITYVANIYA VODY V MERZLYY GRUNT),
Severni Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Leningrad (USSR).
V. Ya. Kulik.
Meteorologiya i Gidrologiya, No 12, p 71-78, December 1971. 15 ref.

Descriptors: *Infiltration, *Infiltration rates, *Capillary conductivity, *Capillary action, *Frozen soils, Frozen ground, Ice, Freezing, Thawing, Wetting, Properties, Physical properties, Soil physical properties, Porosity, Soil moisture, Moisture content, Bound water, Heat balance, Equations, Model studies.
Identifiers: *USSR, *Infiltration capacity, Ice crystals, Ice lenses, Water films.

Techniaues for studying infiltration of water into unfrozen soil were modified to describe the infiltration of water into coarse-textured frozen soil through use of capillary columns. Equations were developed to determine the relation of hydrophysical parameters to ice content of frozen soil and to calculate ice content on the basis of the soil' initial temperature and moisture content. The equations obtained can be used to design and conduct field and laboratory experiments and to measure the infiltration capacity of sands and loamy sand soils. (Josefson-USGS)
W72-14031

ORIGIN OF SALINE SOILS AND THEIR REGIME, VOLUME 2,
Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.
For primary bibliographic entry see Field 03C.
W72-14041

DELAYED YIELD AND UNSATURATED FLOW ABOVE A FALLING WATER TABLE,
Wisconsin Univ., Madison. Water Resources Center.
J. P. Grant, P. L. Monkmeyer, and W. A. Murray.
Available from the National Technical Information Service as PB-212 030, $3.00 in paper copy, $0.95 in microfiche. Wisconsin Water Resources Center, Madison, Completion Report, 1972. 48 p, 14 fig, 9 ref, 6 append. OWRR B-021-WIS (3).

Descriptors: Capillary conductivity, Drawdown, Groundwater, Moisture tension, Permeability, Specific retention, Specific yield, Water table, Zone of saturation.
Identifiers: Delayed yield.

The effects of a falling water table on the gravity drainage of a one-dimensional soil profile and associated delayed yield phenomena are investigated by theory and experiment. The theoretical considerations result in a new type of numerical model which incorporates the falling water table as a time-varying boundary condition. The numerical model differs from conventional models in that the equations of motion (Darcy's Law) and continuity are treated separately and applied to a series of control volumes along the length of the soil profile. Drainage experiments were conducted in a standard sand column which was fitted with an adjustable valve at the base allowing various drawdown rates to occur. The hydraulic conductivity as a function of capillary pressure was determined by a series of steady-state tests in which a constant flow rate was introduced into the column. The moisture content as a function of capillary pressure was determined by disecting the column at equilibrium. A new mathematical model for expressing these soil moisture characteristics was proposed and implemented successfully. The results of this study showed good agreement between the experimental and numerical prediction of delayed yield such as that which might be encountered in pumping-test data in phreatic aquifer.
W72-14052

TRANSFORMATION OF THE TENSOR FORM OF DARCY'S LAW IN INHOMOGENEOUS AND ANISOTROPIC SOILS,
Nevada Univ., Reno. Center for Water Resources Research; and Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 02F.
W72-14055

YIELD AND WATER CONSUMPTION OF THE PLANTS GROWN IN POTS AS INFLUENCED BY SOIL STRUCTURE, (IN RUMANIAN),
Institutul Agronomic, Bucharest (Rumania).
A. Dorneanu.
Lucrari Stiint Inst Agron 'N Balcescu' Ser A. 12: 201-209. 1969. English summary.
Identifiers: Aggregates, *Water consumption, *Fertilizers, Plants, Pots, Roots, Size, *Soils, Structure, System, Yield.

Two kinds of brown-reddish soil were used; the 1st sample, contained 80-86% stable aggregates the size of which ranged from 0.25 to 10 mm while the 2nd contained 42.5-44.5% stable aggregates, their size ranging from 0.25-1 mm. Water consumption was lower in plants grown on fine structured soils. The addition of fertilizers to the 1st sample increased the yield and reduced water consumption. When the moisture level was kept constant at 70% there was no difference in yields for the plants grown on the 2 soils. The root system of the wheat plants helped to build up the soil. This was particularly true for the 0.25-3 mm aggregates. Soil degradated by mechanical action may build up rapidly if the elements required are present thus contributing to the activity of the root system of the plants.--Copyright 1972, Biological Abstracts, Inc.
W72-14173

EROSION-AMELIORATIVE INVESTIGATIONS OF SOILS IN KAZAKHSTAN, (IN RUSSIAN),
For primary bibliographic entry see Field 04D.
W72-14174

PARTICIPATION OF MOISTURE RISING FROM GROUND WATER IN COVERING WATER DEFICIENCIES BETWEEN EVAPOTRANSPIRATION AND PRECIPITATIONS, (IN POLISH),
Szkola Glowna Gospodarstwa Wiejskiego, Warsaw (Poland).
J. Ostromecki.
Rocz Nauk Roln Ser F Melioracji Uzutkow Zielonych. 77 (2): 165-184. Illus. 1969. English summary.
Identifiers: Covering, Deficiencies, *Evapotranspiration, Moisture, Precipitation, *Soil types, Soil profiles.

The theoretical and practical aspects of water movement in unsaturated soil profile zone are discussed. The results of lysimetric experiments are presented for 2 mineral and 3 peat soil types on the drying of the soil with plant cover. Evapotranspiration was covered partly by the moisture reserves of the unsaturated zone and partly by water transport from the saturated zone.--Copyright 1972, Biological Abstracts, Inc.
W72-14177

THE STRUCTURAL COMPOSITION AND WATER STABILITY OF PODZOLIZED BROWN FOREST SOILS IN THE KRASNODAR TERRITORY, (IN RUSSIAN),
Y. I. Brid'ko.
Tr Kuban S-Kh Inst. 20 (48): 97-99. 1970.
Identifiers: Aggregates, *Soil composition, Cultivation, Forest, *Krasnodar, *Podzolized soils, Stability, USSR.

Cultivation of the podzolized soils decreased the content of agronomically valuable structure, and slightly increased water stability. The content of water-stable aggregates (0.25-3 mm) is smaller in fallow fields than under clover (35 and 66%, respectively, in the upper layer).--Copyright 1972, Biological Abstracts, Inc.
W72-14178

IMPROVEMENT OF SOILS BY CULTIVATION IN THE NON-CHERNOZEM ZONE, (IN RUSSIAN).
For primary bibliographic entry see Field 03F.
W72-14180

INORGANIC PHOSPHATE FRACTIONS IN CALCAREOUS SOILS IN RELATION TO MOISTURE AND INCUBATION PERIOD,
Ranchi Univ. (India).
R. N. Sahay, B. P. Sahi, and H. Sinha.
Ranchi Univ J Agric Res. 4: 21-25. Illus. 1969.
Identifiers: *Calcareous soils, *Incubation periods, *Moisture, *Phosphates, Soils.

Studies were conducted on native inorganic P fractionation and transformations of applied P at various periods and moisture regimes. Incubation of soils with 50 ppm P for 4 days at field capacity resulted in an increase of Ca-P and Fe-P and decrease of other forms. Extending the incubation period to 60 days further increased Ca-P, while the other fractions generally remained unchanged. The reverse was generally true under waterlogged conditions except that there was a somewhat less decrease of Ca-P when the incubation period was raised from 4 to 60 days. Transformation of added P to Ca-P and Fe-P increased with the increase of incubation period. Under waterlogged conditions, however, there was considerable release of P at 4 days but fixation took place at 60 days. Significant positive correlations were observed between Fe-P and Ca-P, NH4Cl-soluble P and Ca-P, Olsen P and Al-P, HCl-soluble P with Olsen P and occluded. Fe-P showed significant negative correlation with occluded, Fe-P.--Copyright 1972, Biological Abstracts, Inc.
W72-14189

THE MAIN PHYSICO-CHEMICAL CHARACTERISTICS OF SOILS OF THE VERTISAL AND SODIUM-CONTAINING TYPE IN THE ROCHEFORT MARSH AT ST-LAURENT-DE--LA-PREE (MARITIME CHARENTE, FRANCE),
Institut National de la Recherche Agronomique, Clermont-Ferrand (France). Station d'Agronomie.
J. Morizet, J. DeJou, J. Guyot, R. Millet, and M. Pouvreau.
Identifiers: Charente, *France, Impermeability, Macro, Maritime, *Marsh soils, Porosity, Rochefort, Salinity, *Sodium soils, St-Laurent-De-La-Pree, *Vertisol soils, Hydrogen ion concentration, Soil types.

In soils of the intermediate 'bri' (clay) type hydromorphism is indicated by the frequent presence of spots of gley starting at a depth of 25 cm. The richness of this soil in fine elements, the relatively high level of swelling clay, and the Na-containing characteristics of the complex give the soil special properties, particularly an almost total impermeability in winter, resulting in the presence of a stagnant surface layer of water for a long period of time. This flooding is accentuated by the total absence of relief in the area and sometimes by practices such as artificial damming caused by mud from ditch clearing. There are enormous prisms separated by large clefts, especially in dry periods. Structural stability is excessively low and gypsum ameliorators can only be effective if preliminary work favoring permeability allows Ca migration in the profile. These soils have a very low macroporosity in winter as well as in summer. Grained moisture is sufficient but effective utilization by plants would require deep rooting which is hindered by the compactness of the soils and their frequent hydromorphic characteristics. The chemical properties of 'bri' are similar to those of Na-containing soils of the slightly saline to the alkaline type. The pH is 8-9 except in the humid profile at 0-8 cm Ao. The profile is slightly calcareous. The complex with a dominant calco-magnesian nature also contains a relatively high amount of Na. Salinity is relatively low as shown by the conductivity values (primarily lower than 7 mmhos/cm).--Copyright 1972, Biological Abstracts, Inc.
W72-14190

AN IMPROVED SOIL WATER FLUX SENSOR,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Research.
For primary bibliographic entry see Field 07B.
W72-14192

A HAND-AUGERING METHOD OF INSTALLING ACCESS TUBING FOR NEUTRON MOISTURE METERS,
Forestry Office, Atherton (Australia).
For primary bibliographic entry see Field 07B.
W72-14194

INFILTRATION AND STRUCTURAL CHANGES AS INFLUENCED BY INITIAL MOISTURE CONTENT,
Sydney Univ. (Australia). Dept. of Soil Science.
N. Collis-George, and R. Lal.
Aust J Soil Res. 9 (2): 107-116. Illus. 1971.
Identifiers: Aggregates, Flood, *Infiltration, Irrigation, *Soil moisture, Soils, *Unstable soil.

The variation of infiltration behavior, in columns of aggregates of a structurally stable and an unstable soil, caused by pre-equilibrating the aggregates with a range of relative humidities from 0 to 98%, was measured in terms of advance of the front, cumulative infiltration, slaking, and swelling. In this range, the effect of initial moisture condition on the stable soil (krasnozem) was slight compared with that on the unstable soil (black earth); the wetter the soil initially, the greater was the infiltration rate, and the smaller the slaking and swelling. The change in the behavior of infiltration into systems of stable aggregates is reflected as an increase in the importance of the sorptivity, and a reduction in the importance of the hydraulic conductivity contribution to the steady-state infiltration process. (The aggregates of 1/2-1 mm are such a size that the sorptivity contribution should not normally be detectable in stable soils.) In the unstable soil, the heat of wetting is probably associated with aggregate collapse. The degraded structure of the surface layers prevents fast entry of water into the lower layers. The collapse of structure dominates the infiltration process so that the analysis in terms of sorptivity carried out for stable aggregates cannot be made. The effect of entrapped air on slaking of aggregates of these soils is shown to be negligible compared with effect of initial moisture content. The application of the results to flood irrigation of unstable soils under field conditions is briefly considered.--Copyright 1972, Biological Abstracts, Inc.
W72-14196

REDISTRIBUTION OF SOIL WATER AFTER INFILTRATION,
Commonwealth Scientific and Industrial Research Organization, Wembley (Australia).
A. J. Peck.
Aust J Soil Res. 9 (2): 59-71. Illus. 1971.
Identifiers: Conductivity, Diffusivity, Distribution, Hysteresis, *Infiltration, *Mathematical models, Mean, Moisture, *Soil water redistribution.

The 1-dimensional vertical redistribution of water is studied following infiltration into deep homogeneous soil with an initially uniform moisture content. There is assumed to be no loss of water by evaporation or transpiration during the redistribtuion. Assuming 2 factors to be constants, a 1st-order ordinary differential equation is derived which can be integrated numerically to compute the mean moisture content in the surface zone of draining soil as a function of the redistribution time. The depth of the draining zone in-

creases with time and can be calculated. These factors are relatively constant. Using mean values of the factors for several soils, and only wetting values of the diffusivity and conductivity functions, predicted redistribution behavior agrees well with experimental data. In the remaining cases calculation of the factors for the particular soils, using an approximate method which includes hysteresis data, gives better results. The model is applied to predict the redistribution behavior of different soils under identical treatments, and of a single soil for various infiltration quantities and initial moisture contents.--Copyright 1972, Biological Abstracts, Inc.
W72-14197

REACTION OF SURFACE-APPLIED SUPERPHOSPHATE WITH SOIL: I. THE FERTILIZER SOLUTION AND ITS INITIAL REACTION WITH SOIL,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 05B.
W72-14198

REACTION OF SURFACE-APPLIED SUPERPHOSPHATE WITH SOIL: II. MOVEMENT OF THE PHOSPHORUS AND SULPHUR INTO THE SOIL,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 05B.
W72-14199

STATISTICAL STUDIES ON THE RELATION BETWEEN NITRIFICATION AND SOIL TEMPERATURE AND SOIL MOISTURE,
Deutscher Wetterdienst, Brunswick (West Germany).
H. Schroedter, and C. Tietjen.
Agric Meteorol. 9 (1/2): 77-91. Illus. 1971. (Engl. summ.).
Identifiers: *Soil moisture, Nitrates, *Nitrification, Nitrogen, Relation, *Soil temperature, Statistical studies, Temperature.

By means of linear, linear-transformed and non-linear statements, the relationship is discussed between soil temperature and soil moisture on the one side and nitrification in the upper layers of a bare soil on the other. A non-linear model gives more information than any other. With linear statements only the influence of soil temperature is determined, whereas the non-linear model gives the combined action of soil temperature and soil moisture on the formation of NO3-N. The non-linear model is based on a known model of the weather-yield statistics. By means of a square function, a hyperplane is fitted on the observed data and is resolved into components, resulting in a response hyperboloid, of which the surfaces of equal response are conic sections. The Eigen-values and Eigen-vectors of the square form are calculated from the coefficients of the components to determine the type of the conic sections and they are used for criteria of the effectiveness of the parameters. The Eigen-vectors show that soil temperature and soil moisture are independent in their influence on the nitrification, while the Eigen-values indicate that the efficiency of the parameters is almost identical. The amount of NO3-N increased with rising soil temperature. In the relation to soil moisture there is an optimum near the field capacity. Falling soil temperature in autumn and winter results in a decrease of NO3-N, but only towards a fixed minimum. Calculations by use of the non-linear model result in a minimum of nearly 2 ppm. A considerable increase of NO3-N in spring, indicative of the beginning of microorganic activity, results only after the soil temperature exceeds 5 degree C, even if the soil moisture is near the optimum.--Copyright 1972, Biological Abstracts, Inc.
W72-14200

2H. Lakes

THE PLANKTON OF LAKE GARDNO NEAR THE BALTIC SEA DURING THE SUMMER SEASON,
Polish Academy of Sciences, Pszczna. Hydrobiological Station.
For primary bibliographic entry see Field 05C.
W72-13637

PROCEEDINGS, FOURTEENTH CONFERENCE ON GREAT LAKES RESEARCH.
For primary bibliographic entry see Field 05C.
W72-13640

Department of Energy Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
For primary bibliographic entry see Field 05C.
W72-13655

NUTRIENT STUDIES IN TEXAS IMPOUNDMENTS,
Texas Univ., Austin. Dept. of Environmental Health and Engineering.
For primary bibliographic entry see Field 05C.
W72-13692

OBSERVATIONS ON THE MERCURY CONTENT OF MYOXOCEPHALUS QUADRICORNIS (L.) (TELEOSTEI, COTTIDAE) IN FINLAND,
Helsinki Univ. (Finland). Zoological Museum.
For primary bibliographic entry see Field 05B.
W72-13695

SOME OBSERVATIONS ON THE FOOD OF THE GWYNIAD COREGONUS CLUPEOIDES PENNANTII VALENCIENNES OF LLYN TEGID (LAKE BALA), NORTH WALES,
Liverpool Polytechnic (England).
O. J. Haram, and J. W. Jones.
J Fish Biol. Vol 3, No 3, p 287-295. 1971. Illus.
Identifiers: *Fish diets, Coregonus clupeoides pennantii, Cycles, *Gwyniad, Lake Bala (Wales), Seasonal, Wales.

The seasonal variations in the diet of adult gwyniad C. clupeoides pennantii=C. larvaretus from Llyn Tegid, North Wales were studied. Stomachs were examined to determine fullness, volume and identity of contents. A clear seasonal cycle in food intake was found. Feeding rates were low from Jan. to April but increased during the summer (May-June) and remained at a high level until Dec. The period of low feeding intensity coincided with the time of spawning and the time of annulus formation of both scales and otoliths. The diet showed seasonal changes and 2 main periods were distinguished; Dec. to July, when the fish fed mainly on bottom fauna, and Aug. to Nov., when the diet included both bottom fauna and midwater and surface foods. The gwyniad were opportunistic in feeding, the composition of the diet reflecting availability of food items rather than selective feeding on the part of the fish.--Copyright 1972, Biological Abstracts, Inc.
W72-13738

LIMNOLOGICAL STUDIES OF BIG BEAR LAKE, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 05C.
W72-13739

RAPID METHOD FOR DETECTION AND CHARACTERIZATION OF STEROIDS,
California Univ., Berkeley. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-13781

WATER QUALITY PREDICTIONS BASED ON LIMNOLOGICAL PARAMETERS,
Clemson Univ., S.C. Water Resources Research Inst.
For primary bibliographic entry see Field 05C.
W72-13825

SURFACE WATER SUPPLY OF THE UNITED STATES, 1961-65, PART 1. NORTH ATLANTIC SLOPE BASINS--VOLUME 2. BASINS FROM NEW YORK TO DELAWARE.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-13827

GEOLOGIC CROSS SECTIONS DERIVED FROM SEISMIC PROFILES AND SEDIMENT CORES FROM SOUTHERN LAKE MICHIGAN,
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 02J.
W72-13844

LINMOLOGY OF ONEIDA LAKE WITH EMPHASIS ON FACTORS CONTRIBUTING TO ALGAL BLOOMS,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 05C.
W72-13851

LIFE HISTORY AND ECOLOGY OF THE GIZZARD SHAD, DOROSOMA CEPEDIANUM (LE SUEUR) WITH REFERENCE TO ELEPHANT BUTTE LAKE,
New Mexico Agricultural Experiment Station, University Park.
D. B. Jester, and B. L. Jensen.
Agricultural Experiment Station Research Report 218, January 1972, 56 p, 21 tab, 26 fig, 92 ref.

Descriptors: *Lakes, *Life history studies, *Ecology, *Fish control agents, *Fish establishment, Fish food organisms, Fish management, Fisheries, History, Forages, Ranges, Great Plains, Wyoming, Colorado, Continental margin, New Mexico, Food chains, Sport fish, Recreation, Growth rates, Reproduction, Mud flats, Turbidity, Age, Growth stages, Length, Time, Weight, Fecundity, Fish diseases, Mortality, Predation.
Identifiers: *Elephant Butte Lake.

The range of gizzard shad is extended by the locality of this study and by findings in the abundant literature to a broad strip along the western boundary encompassing the Great Plains of Wyoming and Colorado westward to the Continental Divide in New Mexico and north-central Mexico. Shad is valuable as a food chain link of game fishes. Shad has a high reproductive potential and rapid growth rates even in shallow lakes with mud bottoms and excessive turbidity. Shad is an esteemed forage fish even under limited conditions. About 7,500 fish from Elephant Butte Lake were measured by the Lee Method for age and growth, mean total lengths, annual growth increments, and grand mean lengths and increments. Time required to gain 100 grams varied from less than one to five years in the lakes studied. Hile Method was used to determine condition or relative robustness. Fecundity, food habits, disease, sport fishery ability, mortality and predation were also studied. Gizzard shad have great value as forage to support game fish; abundance and continued stunting indicate that shad are sufficiently numerous to support additional game fishes. (Popkin-Arizona)
W72-13927

SIGNING OF GREAT LAKES WATER QUALITY AGREEMENT, APRIL 15.
For primary bibliographic entry see Field 05G.
W72-13947

TILAPIA FISHERY IN LAKE MARUIT: AGE AND GROWTH OF TILAPIA NILOTICA L. IN THE LAKE,
Alexandria Inst. of Oceanography and Fisheries (Egypt).
S. El-Zarka, A. H. Shaheen, and A. A. El-Aleem.
Bull Inst Oceanogr Fish. 1: 149-182. Illus. Map. 1970.
Identifiers: *Age, Fishery, *Growth, *Lake Maruit, Tilapia-Galilaea, *Tilapia-Nilotica, Tilapia-Zilli, United Arab Republic.

Tilapia is an important source of protein food for Egyptians. It provides about 70% of the total fish production in Egypt. Because of the economical importance of this fish extensive research program was started in 1957 to survey its fisheries in the inland waters of Egypt. This study is confined to T. nilotica L. in Lake Maruit. Lake Maruit is a shallow water area that lies along the northern Mediterranean coast to the south of Alexandria, with depth about 1 m. It has no direct connection with the sea and received drainage water from the adjacent cultivated lands. Tilapia species were identified as T. nilotca L., T galilaea Art., T. zilli Gerv. and T. nilotica (variety x). The average annual production of this fish is 1741 tons and constitutes about 80% of the total catch of the lake. The study was based upon monthly samples taken from experimental fishing gears used for catching Tilapia in Lake Maruit as well as from the commercial catch. The T. nilotica fishery depends on age group I. In the combined 1957-1958 samples, age group I contributed 92.1% of the total catch, while older age group II and age group III constituted only 5.7% and 2.2%, RESPECTIVELY.==Copyright 1972, Biological Abstracts, Inc.
W72-14000

EFFECT OF EDDY DIFFUSIVITY ON WIND--DRIVEN CURRENTS IN A TWO-LAYER STRATIFIED LAKE,
National Aeronautics and Space Administration, Cleveland, Ohio. Lewis Research Center.
R. T. Gedney, W. Lick, and F. B. Molls.
Available from NTIS, Springfield, Va 22151 as NASA TN D-6841. Price $3.00 paper copy; $0.95 microfiche. National Aeronautics and Space Administration Technical Note NASA TN D-6841, June 1972. 37 p, 10 fig, 11 ref, 2 append.

Descriptors: *Thermal stratification, *Lakes, *Winds, *Eddies, *Diffusivity, Currents (Water), Circulation, Mathematical studies, Equations, Thermocline, Hypolimnion, Water temperature.
Identifiers: *Wind-driven currents, Eddy diffusivity.

The steady-state wind-driven circulation is numerically calculated in a rectangular stratified lake. The lake is composed of two layers having uniform but unequal densities and eddy diffusivities. The position of thermocline and the three-dimensional velocities in both layers are calculated using the shallow lake equations of P. Welander. The results show that, as the eddy diffusivity in the hypolimnion is increased, the thermocline tilt and hypolimnetic velocities increase. The effect of the other variables such as wind stress, density, basin length, and mean thermocline depth are shown also. (Woodard-USGS)
W72-14010

REDUCTION OF RUNOFF INTO KARA-BOGA-Z-GOL AND THE FUTURE LEVEL OF THE CASPIAN SEA (OGRANICHENIYE STOKA V ZALIV KARA-BOGAZ-GOL I BUDUSHCHIY UROVEN' KASPIYSKOGO MORYA),
Gidrometeorologicheskiĭ Nauchno-Issledovatelskii Tsentr, Leningrad (USSR).
For primary bibliographic entry see Field 02E.
W72-14032

CALCULATION OF RATE OF EXTENSION OF ICE COVER IN AFTERBAYS OF RESERVOIRS (RASCHET NASTUPLENIYA KROMKI LEDYANOGO POKROVA V NIZHIKH B'YEFAKH VODOKHRANILISHCH),
Gidrometeorologicheskii Nauchno-Issledovatelskii Tsentr, Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W72-14033

THE EFFECTS OF INCREASING SALINITY ON THE PYRAMID LAKE FISHERY,
Nevada Univ., Reno. Max C. Fleischmann Coll. of Agriculture.
For primary bibliographic entry see Field 05C.
W72-14054

ECOLOGY AND PRODUCTION OF SALVINIA NATANS HIFFIM; IN KASMIR,
Sri pratap coll., Srinagar (India). Dept. of Botany.
D. P. Zutshi, and K. K. Vass.
Hydrobiologia. 38 (2): 303-320. Illus. Map. 1971.
Identifiers: Carbon, Ceratophyllum-Demersum-D, Control, Ecology, Hydrocharis-Dubia-M, *Kashmir, Organic, Production, *Salvinia-Natans-P, Shade, Hydrogen ion concentration, Lakes.

Ecological problems arising as a result of rapid growth of S. natans Hoffim in some lakes of Kashmir were studied. High viability of spores coupled with rapid vegetative propagation seem to be responsible for the spread of the weed. Lake channels protected from a wind by a canopy of trees are the most favorable situations in which Salvinia produces a thick mat. Water in these channels is rich in nutrients. Oxygen-poor layers of water beneath the mat are detrimental for insect and fish life. Changing light conditions have profound influence on the submerged vegetation. The most common associates of Salvinia are Hydrocharis dubia and Ceratophyllum demersum. Maximum plant biomass is recorded during Aug.-Sept. with higher efficiency at partially shaded sites. A correlation exists between caloric values and dry matter production and between caloric value and percent organic C. Under laboratory conditions, water of a pH between 4.6-6.0, NaCl concentrations higher than 1% and continuous submergence under water are harmful to the growth of the weed. Partial shady situations seem to be quite beneficial for the growth. Harvesting would probably be the most economical method of control.--Copyright 1972, Biological Abstracts, Inc.
W72-14071

THE BIOLOGY AND FISHERY OF MUGIL SALIENS (RISSO) IN LAKE QUARUN, U. A. R.,
Cairo Inst. of Oceanography and Fisheries (Egypt).
Salah El-Zarka, and H. M. El-Sedfy.
Bull Inst Oceanogr Fish, 1: 1-26, Illus, Maps, 1970.
Identifiers: Fish, Lakes, Mugil-Capito, Mugil-Cephalus, *Mugil-Saliens, *Lake Quarun, Solea-Vulgaris, United Arab Republic.

The salinity increase of lake Quarun directly affected the freshwater fishes which were of Nile Origin. To compensate for the loss of freshwater fishes, the lake was stocked with Mediterranean fishes including Solea vulgaris and Mugil spp. Several members of the family Mugilidae (Mugil cephalus, M. capito and M. saliens) were transplanted. The first lot of fry was planted in 1928 and stocking was continued each year thereafter. Of the mullet species, only M. saliens was able to spawn in the lake. M. saliens fry were found in Dec., 1961, near the inlet of Saeed drain and this was during a period when no fry had been stocked from Mex farm near Alexandria catch, length-weight relationship, spawning and sex ratio of M. saliens are given.--Copyright 1972, Biological Abstracts, Inc.
W72-14107

EVALUATION OF INTENSIVE FRESHWATER DRUM (APLODINOTUS GRUNNIENS) REMOVAL IN LAKE WINNEBAGO, WISCONSIN, 1955-1966,
Wisconsin Dept. of Natural Resources, Madison.
G. R. Priegel.
Tech Bull, 47. 1-28, Illus, 1971.
Identifiers: *Aplodinotus-Grunniens, Black crappie, *Drum fish, Lakes, Sauger, Walleye, *Lake Winnebago, Wisconsin, Yellow perch, White bass.

An intensive freshwater drum removal program was undertaken on Lake Winnebago to evaluate the effects of freshwater drum removal on the freshwater drum population and other fish species. There were benefits to the sport fishery that appeared to result from the freshwater drum removal program. After 1959 the catch of white bass and black crappie in nets definitely increased. Walleye, sauger and the yellow perch populations fluctuated in abundance but the catch in nets after 1959 increased, especially that of the sauger. There was no indication that commercial removal of freshwater drum was detrimental to any game or panfish population.--Copyright 1972, Biological Abstracts, Inc.
W72-14109

ASPECTS OF THE NUTRITIVE DYNAMICS AND TROPHIC RELATIONSHIPS OF THE BURBOT (LOTA LOTA LOTA L.) IN THE UPPER MURES RIVER, (IN RUMANIAN),
Babes-Bolyai Univ., Cluj (Rumania).
S. Gyurko, and Z. I. Nagy.
Stud Cercet Biol Ser Zool. 23 (4): 367-376. Illus. 1971. English summary.
Identifiers: *Burbot, Dynamics, *Lota-Lota-Lota, *Mures River, Nutritive relationships, River, Romania, Stock, Trophic level.

The qualitative and quantitative composition of the food of L. lota lota is presented in relation to season, year class and body length. Data analysis indicate that the burbot may be safely used to stock some of the Romanian lakes.--Copyright 1972, Biological Abstracts, Inc.
W72-14127

PATTERNS OF LAKESHORE USAGE AROUND LAKE BEMIDJI,
Bemidji State Coll., Minn.
For primary bibliographic entry see Field 05C.
W72-14131

INTRASPECIFIC COMPETITION IN LAKE--DWELLING TRICLADS: A LABORATORY STUDY,
University Coll. of North Wales, Bangor. Dept. of Zoology.
T. B. Reynoldson, and L. S. Bellamy.
Oikos. 22 (3): 315-328. Illus. 1971.
Identifiers: *Food competition, Dugesia-Polychroa, *Lakes, Polycelis-Nigra, Polycelis-Tenuis, *Triclads.

The population dynamics of Polycelis nigra, P. tenuis and Dugesia polychroa were studied in laboratory ecosystems provided with a constant supply of natural food and maintained under a temperature regime which followed that of an outdoor pond. The same phenomena, related to breeding, such as shrinkage of adults, mortality of small individuals and curtailment of egg production occurred in these populations as was observed earlier in field populations. Analysis of size-structure, population numbers and biomass suggested that the major changes were the result of intraspecific competition for food. Experiments to study the effect of varying the population density of triclads upon food uptake, under conditions of a constant food supply, showed that competition may occur although all the food is not utilized. This was attributed to the aggregation of triclads on individuals prey. Certain anomalies in the performance of some of the populations were con-

sidered to be partly due to chance events in this feeding behavior of triclads. While exocrene substances influenced the fecundity of triclad populations, this was a minor factor compared with intraspecific competition for food.--Copyright 1972, Biological Abstracts, Inc.
W72-14132

CLADOCERA STUDIES ON LAKE BALATON: IV. SUBFOSSIL REMAINS IN THE SEDIMENTS OF LAKE BALATON II,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
S. Olga.
Ann Inst Biol (Tihany) Hung Acad Sci, 37: 247-272, Illus, 1970, Hungarian and Russian summary.
Identifiers: Acroperus-Harpae, *Lake Balaton, Camptocercus-Rectirostris, *Cladocera, Eurycerus-Lamellatus, Fossils, *Hungary, Lakes, Leydigia, Pleuroxus, Sediment.

The frequency and ecological requirements of recent and subfossil Cladocera in Lake Balaton, Hungary, were investigated. Eurycercus lamellatus, Camptocercus rectirostris, Acroperus harpae, 2 spp. of Leydigia and 5 spp. of Pleuroxus are discussed.--Copyright 1972, Biological Abstracts, Inc.
W72-14160

GLASS EFFECT AND THE MICROBIAL PLANKTON-SESTON RELATION IN THE WATER OF LAKES BALATON AND BELSO,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
For primary bibliographic entry see Field 05C.
W72-14161

THE HORIZONTAL DISTRIBUTION OF ROTIFERA PLANKTON IN LAKE BALATON,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
For primary bibliographic entry see Field 05C.
W72-14163

LITTORAL ONISCOIDS FROM THE THAU BASIN (MEDITERRANEAN LITTORAL POND): FAUNISTIC AND ECOLOGICAL STUDY (IN FRENCH),
Montpellier Univ. (France). Faculte des Sciences.
R. Chamboredon, J. G. Lagarrigue, and Jean-Paul Trilles.
Arch Zool Exp Gen, 111 (2): 181-211, Illus, Map, 1970, English and German summary.
Identifiers: Armadillidae, Armadillididae, *Isopod fauna, Ecological studies, Ligiidae, Littoral, Mediterranean littoral ponds, Oniscidae, Oniscoids, Ponds, Porcellionidae, *Thau Lake basin, Tylidae.

This work provides exact faunistical and zoological information concerning isopod fauna of Thau lake shores. This basin, a part of the long string of many Languedoc lakes, was studied due to its hypomarine condition. The survey during a full year discovered at least 17 oniscoid species (or sub-species) distributed within 6 families: Armadillidae, Armadillididae, Ligiidae, Oniscidae, Procellionidae and Tylidae.--Copyright 1972, Biological Abstracts, Inc.
W72-14166

FUNCTIONAL MODEL OF THE LAKE ECOLOGICAL SYSTEM (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Institut Evolyutsionnoi Fiziologii i Biokhimii.
For primary bibliographic entry see Field 05C.
W72-14167

HARVEST, SURVIVAL, AND COST OF TWO DOMESTIC STRAINS OF TAGGED RAINBOW TROUT STOCKED IN LAKE BERRYESSA, CALIFORNIA,
California State Dept. of Fish and Game, Sacramento.
R. R. Rawstron.
Calif Fish Game. 58 (1): 44-49. 1972.
Identifiers: *Lake Berryessa, *California, Costs, Harvest, Lakes, *Rainbow trout, Strains, Survival, Tagged, Trout.

Tagged rainbow trout of the Coleman Kamloops strain and the Mt. Whitney strain were planted in Lake Berryessa, Napa County, California. The former was less vulnerable to shore anglers shortly after planting and had a more rapid limnetic distribution, equal mean annual harvest rates, a higher survival, and a lower cost to the angler's creel compared to the latter.--Copyright 1972, Biological Abstracts, Inc.
W72-14181

2I. Water in Plants

OLFACTION IN PARENT STREAM SELECTION BY THE ALEWIFE (ALOSA PSEUDOHARENGUS),
Rhode Island Univ., Kingston. Graduate School of Oceanography.
B. E. Thunberg.
Anim Behav. Vol 19, No 2, p 217-225. 1971. Illus.
Identifiers: *Fish behavior, Alewives, *Aquatic environment, Alosa pseudoharengus, Olfaction, Selection, Streams.

The ability of A. pseudoharengus, to discriminate between water from its spawning pond and from neighboring ponds was studied. Fish were tested in a 2 choice selection tank with various water combinations. Single fish were placed in the tank and their time spent at each end was recorded. A control period was statistically compared to the test period. The alewives strongly preferred home water. Selection did not occur when the nares were plugged with cotton, but upon removal of the cotton, selection for home water reappeared. Evidence presented here for home stream selection on the basis of odor suggests that alewives may use this mechanism to return to their parent stream.--Copyright 1972, Biological Abstracts, Inc.
W72-13675

OSMOTIC ACCLIMATION IN THE RED RIVER PUPFISH, CYPRINODON RUBROFLUVIATILIS,
Mount Desert Island Biological Lab., Salisbury Cove, Me.
J. L. Renfro, and L. G. Hill.
Comp Biochemi Physiol A Comp Physiol. Vol 40, No. 3, p 711-714. 1971. Illus.
Identifiers: *Fish physiology, *Osmotic pressure, Acclimation, Cyprinodon rubrofluviatilis, Pupfish, Freshwater, Saline water.

The serum osmotic pressure in freshwater acclimated pupfish was 321 m-osmoles/kg-water. Saltwater acclimated fish had a serum osmotic pressure of 378 m-osmoles/kg-water. Abrupt transfer from freshwater to saltwater showed that the pupfish could acclimate to increased salinity within 8 hr. During acclimation to saltwater the serum osmotic pressure reached a peak, after 7 hr, of 512 m-osmoles/kg-water. It was concluded that C. rubrofluviatilis was a very efficient and tolerant osmoregulator.--Copyright 1972, Biological Abstracts, Inc.
W72-13680

DATA ON THE ECOLOGY AND GEOGRAPHICAL DISTRIBUTION OF THE TESTACEANS OF THE AREA OF THE FUTURE DAM LAKE AT IRON GATE,
S. Godeanu.
Stud Cercet Biol Ser Zool. Vol 23, No 5, p 479-486. 1971. Illus. English summary.
Identifiers: *Aquatic animals, Association, Dams, *Distribution, Ecology, Geography, Romania, Testaceans.

An analysis was made of the testacean fauna found in the Danube river, in the running waters of its left bank tributaries and in the permanent or temporary pools situated below the future dam lake. The testacean association is analyzed from an ecological and geographical point of view.--Copyright 1972, Biological Abstracts, Inc.
W72-13755

SEASONAL VARIATIONS IN THE AVIFAUNA COMPOSITION OF THE LAVOURS SWAMP (AIN),
Center of Ornithology in the Rhone Alps, Lyon (France).
P. Cordonnier.
Alauda. Vol 39, No 3, p 169-203, 1971. Illus. (English summary).
Identifiers: *Birds, *Environmental effects, Abundance, Carex-M, Communities, Composition, Fauna, France, Plants, Seasonal, Swamps, Variations.

The structure of the avian community was studied in a 2.5 ha marsh in relation to the seasonal variations and the distribution of plant communities. The density and biomass of breeding birds were calculated in 3 different biotopes by the quadrat method. Density increased from lowest vegetation (Carex) to forest. Various birds in the different plant communities depend on abundance and variety of food. Censuses by the Punctual Index Abundance (PIA) showed comparison of single species abundance in similar habitats. The annual cycle studied by PIA, can be divided in 5 'ornithological seasons'. Highest abundance was recorded in spring during migration. Lowest abundance was in January when the weather influence was strongest. It would be disastrous to the birds to convert this marsh for agricultural purposes.--Copyright 1972, Biological Abstracts, Inc.
W72-13799

THE ELEMENTS OF ENERGY BALANCE IN GRASS CARP (CTENOPHARYNGODONIDELLA VAL.): I,
Polish Academy of Sciences, Warsaw. Inst. of Experimental Biology.
Z. Fischer.
Pol Arch Hydrobiol. Vol 17, No 4, p 421-434. 1970. Illus.
Identifiers: Ctenopharyngodon Idella, Elements, Energy, *Grass carp, *Metabolism, Oxygen consumption.

Energy changes were investigated in grass carp bred on plant food. The 02 consumption, excretion of CO12 and N, value of food ration and the basic energy indicators K1 and K2 and also U-12 were determined.--Copyright 1972, Biological Abstracts, Inc.
W72-13815

SARCOSPHAERA EXIMIA (DUR. ET LEV.) R. MRE. IN THE PIENINY NATIONAL PARK,
B. Guminska.
Acta Mycol. Vol 4, No 1, p 131-146. 1968. Illus. Maps. English summary.
Identifiers: *Poland, *Sarcosphaera eximia, *Pieniny National Park.

Wet spring weather caused an abundance of S. eximia in the park. The fruitbodies were typical. They occurred in limestone soil in a fir forest. S. eximia is thought to be a rare species because it does not grow every year. In Poland it is known from 7 localities. In Pieniny National Park S. eximia was found at 6 places.--Copyright 1972, Biological Abstracts, Inc.
W72-13909

A DISTRIBUTIONAL STUDY OF MISSOURI FISHES,
Missouri Dept. of Conservation, Jefferson City.
W. L. Pflieger.
Univ Kansas Publ Mus Nat Hist. Vol 20, No 3, p 225-570. 1970. Map.
Identifiers: *Fish populations, Distribution, Environment, Fish, *Missouri.

The distribution of Missouri fishes is described. The patterns of fish distribution are interpreted in terms of environmental conditions and historical factors. For the state, 191 spp. are listed. Four fish faunal regions are recognized. Three of these (Ozark, lowland and prairie) correspond closely to major physiographic subdivisions of Missouri. The 4th faunal region (big river) includes the Missouri and Mississippi rivers and the downstream portions of their major tributaries. The faunal regions are separated by broad ecotones designated as an 'Ozark border' where fishes characteristic of different faunal regions meet and mix in complex fashion. Missouri fishes are classified into 4 primary and 3 secondary faunal groups. Primary faunal groups include species having their distribution centered in a single faunal region. Secondary faunal groups include species that are more widespread. Habitat modifications by man during the last 2 centuries have resulted in rapid and dramatic changes in the distribution of many fishes. Five spp. which occurred in the state 30 yr ago are no longer present. Numerous others are more restricted in distribution. Several are more abundant and widespread than formerly.--Copyright 1972, Biological Abstracts, Inc.
W72-13910

CONTROLLED-ENVIRONMENT VEGETABLE PRODUCTION: RESULTS OF TRIALS AT PUERTO PENASCO, MEXICO, 1968-1970,
Arizona Univ., Tucson. Environmental Research Lab.
For primary bibliographic entry see Field 03F.
W72-13926

SIMULTANEOUS DETERMINATION OF SHORT-PERIOD PHOTOSYNTHESIS AND EVAPOTRANSPIRATION,
Nebraska Univ., Lincoln. Dept. of Horticulture and Forestry.
For primary bibliographic entry see Field 03F.
W72-14009

EFFECT OF SOIL MOISTURE ON THE PHASE CHARACTERS OF HATCHLINGS IN THE DESERT LOCUST, SCHISTOCERCA GREGARIA FORSK,
Field Station for the Investigation of Locusts, Bikaner (India).
S. C. Harjai, and H. L. Sikka.
Indian J Entomol, 2 (4): 298-302, 1970 (1971).
Identifiers: *Desert locust, *Locust hatchlings, Schistocerca-Gregaria, *Soil moisture.

The effect of incubating the desert locust eggs in soils of different moisture content was studied and it was found that 8% soil moisture at temperature 32.5 plus or minus 0.50 deg C was the optimum for development from the point of view of viability-cum-hatchability percentage. Soils with far lower or far higher levels of moisture had the common effect of prolonging the incubation. However, low moisture gave rise to solitary type hatchlings while the higher moisture gave rise to black hatchlings characteristic of gregarious breedings.--Copyright 1972, Biological Abstracts, Inc.
W72-14092

A SIMPLE MEANS OF DETACHING TREE SHOOTS UNDER WATER FOR PHYSIOLOGICAL STUDY,
Australian National Univ., Canberra. Dept. of Forestry.
G. B. Wood.
Aust For Res, 5 (2): 37-38, Illus, 1971.
Identifiers: *Photosynthesis, Physiological study, *Pinus-Radiata-G, *Tree shoots, Trees, Under water.

The technique appears suitable for studies in photosynthesis, but unsuitable for studying transpiration in Pinus radiata since the transpiration rate of seedlings was rapidly and substantially increased by the treatment (158 + 12% of initial value after 4 hr).--Copyright 1972, Biological Abstracts, Inc.
W72-14096

MOISTURE STRESS AND STEM DIAMETER IN YOUNG DOUGLAS-FIR,
Oregon State Univ., Corvallis. School of Forestry.
J. B. Zaerr.
For Sci, 17 (4): 466-469, Illus, 1971.
Identifiers: Daytime, *Stem diameter, *Douglas-Fir-G, *Moisture stress, Pseudotsuga-Menziessi-G.

The internal plant moisture stress (PMS) and stem diameter of 9 Douglas-fir (Pseudotsuga menziesii) trees were measured throughout the day on 2 clear days in Sept. The PMS and diameter curves were out of phase by several hr. PMS increased in the morning, remained constant for a while, then decreased in the afternoon; but diameters decreased until late afternoon and then increased.--Copyright 1972, Biological Abstracts, Inc.
W72-14098

THE KINETICS OF WATER ABSORPTION IN STRATIFYING AND NONSTRATIFYING NOBLE FIR (ABIES PROCERA REHD.) SEEDS,
British Columbia Forestry Service, Victoria; and Department of the Environment Victoria (British Columbia).
D. G. W. Edwards.
Can J For Res, 1 (4): 235-240, Illus, 1971, French summary.
Identifiers: Abies-Procera-G, *Absorption, Fir-G, Germination, Kinetics, *Noble fir, Seeds, Temperature.

Rate of water absorption by empty and filled noble fir seeds was faster for 25 deg C (nonstratifying) seeds than for 5 deg C (stratifying) seeds during the initial stages. After the first 3 days water uptake by empty seeds essentially ceased at 25 deg C, but absorption was continuing at 5 deg C after 28 days, water levels averaging nearly 60% higher than at 25 deg C. Water uptake by empty seeds was used to express absorption by the seedcoat of filled seeds. When germination was first seen at 25 deg C, the seedcoat contained 60% of all the water in the seed. Differences in absorption between stratifying and nonstratifying filled seeds were more obscure because of absorption by the internal tissues. At 25 deg C, water uptake by filed seeds followed the 3 generally recognized phases. The transfer of empty seeds from 25 to 5 deg C upset the moisture equilibrium established after 15 days at 25 deg C, but although water uptake resumed, the water levels after 45 days were not as high as for empty seeds exposed continuously to 5 deg C for 28 days. This was interpreted as indicating that the imbibant had undergone some change which modified the forces of hydration.--Copyright 1972, Biological Abstracts, Inc.
W72-14099

STUDIES OF MOISTURE STATUS AND STORAGE CONDITIONS OF SPRING-LIFTED, MUD-PACKED DOUGLAS-FIR SEEDLINGS,
British Columbia Univ., Vancouver. Dept. of Botany.
G. E. Mellor, R. A. Keller, and E. B. Tregunna.
Can J For Res, 1 (4): 223-227, Illus, 1971, French summary.
Identifiers: *Douglas-Fir-G, Growth, *Moisture status, Mud-packed conditions, Pseudotsuga-Menziesii-G, Roots, *Seedlings, Spring, Storage, Survival, Temperature.

Two-year-old (2-0) Douglas-fir (Pseudotsuga menziesii) seedlings were lifted in the spring and mud-packed. These seedlings were tested (a) for moisture status during and after mud-packing or (b) for the effects of various storage conditions. Moisture status measurements indicated that the mud-packing process placed a reversible moisture stress on the seedlings. When the seedlings were planted, however, the mud-packed seedlings displayed a higher moisture stress than bareroot or unlifted seedlings. There was no difference in moisture stress between bare-root or unlifted seedlings. Mud-packed seedlings, stored in the field for 19 days and subsequently planted, had higher survival and root growth than those having other storage conditions. The other storage conditions included higher and lower temperature than in the field and light versus dark. Treatment of the mud-packs with fertilizer and vermiculite had no effect on any of the parameters measured.--Copyright 1972, Biological Abstracts, Inc.
W72-14100

GROWTH OF KNOWN AGE MUSKELLUNGE (ESOX MASQUINONGY) IN WISCONSIN AND VALIDATION OF AGE AND GROWTH DETERMINATION METHODS,
Wisconsin Dept. of Natural Resources, Madison.
L. D. Johnson.
Tech Bull. 49. 1-24. Illus. 1971.
Identifiers: *Age determination, Esox-Masquinongy, Fin, *Growth determination, *Muskellunge, Scale, Validation, Wisconsin.

The presence of a large number of known age fish from 1955-1969 provided the opportunity to gather empirical growth data and to compare 2 widely used methods of determining age and growth. Through the use of either scale samples or fin sections, ages of muskellunge 1 through 9 could be fairly accurately determined. For fish between ages 9 and 11, the fin section method was the more accurate of the means of determining age. For making back calculations of growth, the scale sample method was found to be superior. On the basis of empirical and calculated data, differential muskellunge growth was found in the 3 lakes studied.--Copyright 1972, Biological Abstracts, Inc.
W72-14110

EGGS OF FLOODWATER MOSQUITOES: XIV. NORTHERN AEDES (DIPTERA: CULICIDAE),
Illinois Univ., Urbana. Dept. of Entomology.
W. R. Horsfall, and F. R. Voorhees.
Ann Entomol Soc Am. 65 (1): 123-126. Illus. 1972.
Identifiers: *Aedes, Culicidae, Diptera, *Eggs, *Electron scanning microscope, *Mosquitoes, Northern.

Whole eggs and segments of chorion of species of A. communis (De Geer), A. hexodontus Dyar, A. pionips Dyar, A. pullatus (Coquillett), A. dianteus Howard, Dyar, and Knab, A. punctor (Kirby), A. trichurus (Dyar), A. intrudens Dyar, A. excrucians (Walker), A. barri Rueger, A. fitchii (Felt and Young) and A. cinereus Meigen are illustrated by photographs obtained by scanning electron microscopy. Distinctive features are visible optically by stereomicroscopy in white light.--Copyright 1972, Biological Abstracts, Inc.
W72-14115

EFFICIENCY OF SUCROSE FLOTATION IN RECOVERING INSECT LARVAE FROM BENTHIC STREAM SAMPLES,
Chanute Technical Training Center, Chanute AFB, Ill.
W. M. Pask, and R. Costa.
Can Entomol. 103 (12): 1649-1652. 1971.
Identifiers: *Benthic streams, Chironomidae, Hemiptera, *Insect larvae, Samples, *Sucrose flotation, Trichoptera, Zygoptera, *Sandy Creek (NY).

Duplicate benthic stream samples were collected from three sites on Sandy Creek (Lake Ontario Watershed) in Western New York, 8 and 22 Sept., 1970. Samples taken on 8 Sept. were preserved in 10% formalin. Samples taken on 22 Sept. were not preserved. Insect specimens were removed from both sets of samples by flotation with a sucrose solution of 1.12 sp. gr. Preserved and unpreserved samples were compared for efficiency of recovery of insect larvae. Mean recovery for preserved samples was 90.78% compared with 83.03% for unpreserved samples. The range of recovery values for unpreserved samples (66.7%) was more than twice as great as that of preserved samples (29.5%). A paired t-test for means of all taxa showed no significant difference ($P < 0.001$) between recovery values for preserved and unpreserved samples. In fact, preservation may enhance the recovery of certain groups--Zygoptera, Hemiptera, Trichoptera, and Chironomidae. Apparently samples may be preserved without sacrificing recovery of any specific groups of insect larvae.--Copyright 1972, Biological Abstracts, Inc.
W72-14116

LODGEPOLE PINE-DWARF MISTLETOE XYLEM WATER POTENTIALS,
Colorado State Univ., Fort Collins. Dept. of Botany and Plant Pathology.
W. R. Mark, and C. P. P. Reid.
For Sci. 17 (4): 470-471. Illus. 1971.
Identifiers: Arceuthobium-Americanum-D, *Mistletoe-D, Pine-G, *Pinus-Contorta-G, *Xylem water potential.

The xylem water potentials of dwarf mistletoe (Arceuthobium americanum Nutt. ex. Engelm.) shoots and the lodgepole pine (Pinus contorta) branches on which they were growing were determined. A water potential gradient favorable to the dwarf mistletoe shoots indicates that the shoots are able to obtain water from their host even when the xylem of the latter is under considerable water stress.--Copyright 1972, Biological Abstracts, Inc.
W72-14119

IMPROVED THERMOCOUPLE PSYCHROMETER FOR THE MEASUREMENT OF PLANT AND SOIL WATER POTENTIAL: II. OPERATION AND CALIBRATION,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
For primary bibliographic entry see Field 07B.
W72-14120

STROBILI DEVELOPMENT IN WESTERN WHITE PINE: PERIODICITY, PREDICTION, AND ASSOCIATION WITH WEATHER,
Forest Service (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
G. E. Rhefeldt, A. R. Stage, and R. T. Bingham.
For Sci. 17 (4): 454-461. Illus. 1971.
Identifiers: Deficits, Development, Periodicity, Pine-G, Pinus-Monticola-G, Prediction, *Strobili development, Weather, *Western White Pine.

Variation in yearly counts of female strobili during various stages of development was studied from 18-yr records of 4 trees in northern Idaho. Spectral analyses indicated that periodicity in production of strobili by individual trees followed major cycles of 4 yr; cycles of 3 yr were of secondary importance. Cospectral analyses indicated that cycles of the 4 trees were in phase. Autoregression was used to develop models for predicting strobili production. Regressions involving lags of 4 yr in the dependent variable accounted for 47 and 41% of the variation in counts of immature and mature strobili, respectively. Association of strobili production with daily moisture stress indicated: water deficits during early summer of the year in which strobili matured were directly related to abortion of strobili; moisture stresses during early summer of the 1st and 2nd yr preceding emergence of strobili from the bud scales were associated with high strobili counts; and water deficits during late summer in the year preceding strobili emergence were detrimental to strobili development.--Copyright 1972, Biological Abstracts, Inc.
W72-14121

ALLELOPATHY AMONG THE AQUATIC PLANTS,
Polish Academy of Sciences, Warsaw. Dept. of Applied Limnology.
W. Szczepanska.
Pol Arch Hydrobio. 18 (1): 17-30. Illus. 1971. Polish summary.
Identifiers: *Allelopathy, *Aquatic plants, Carex-Hudsoni-M, Equisetum-Limosum-P, *Pharagmites-Communis-M, Schoenoplectus-Lacustris-M, Soils, Typa-Latifolia-M, Reed.

Pot experiments were carried out on the interrelations of aquatic plants. The decrease of reed (Phragmites communis) production was generally accompanied with the increase of the production of associated plant species, and inversely. The type of soil modified the growth of monospecies culture, and influenced the character of interrelations among the plants in mixed cultures. Other plants were Schoenoplectus lacustris, Equisetum limosum, Typha latifolia and Carex hudsoni.--Copyright 1972, Biological Abstracts, Inc.
W72-14130

STUDIES ON ANURAN WATER BALANCE: II. DESICCATION IN THE AUSTRALIAN FROG, NOTADEN BENNETTI,
University of New England, Armidale (Australia). Dept. of Zoology.
Harold Heatwole, Elizabeth Cameron, and Grahame J. W. Webb.
Herpetologica. 27 (4): 365-378. Illus. 1971.
Identifiers: *Australian frog, Adaptive behavior, Desiccation, Frogs, *Notaden-Bennetti, *Water balance (Anuran).

Rate of evaporative loss in N. bennetti is dependent upon amount of activity. Neither standard rate of loss nor vital limit show any adaptive differences in comparison to other species. However, N. bennetti is behaviorally adapted by dry habitats by selecting high humidities, reducing activity during desiccation, aggregating when moisture conditions are unfavorable, burrowing (emerging only when surface moisture is abundant), and not burrowing in extremely dry soils. The extent of desiccation influences the frequency of burrowing and aggregation. These responses are not modified by lighting conditions and do not seem to be greatly influenced by an internal activity rhythm.--Copyright 1972, Biological Abstracts, Inc.
W72-14133

WATER PROFILE FLUCTUATIONS RECORDED BENEATH SOME FORAGE PLANTS DURING THE DRY SEASON USING THE NEUTRON METHOD, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Abidjan (Ivory Coast). Centre d-Adiopodoume.
For primary bibliographic entry see Field 07B.
W72-14138

USE OF ULTRAVIOLET LIGHT TO INCREASE THE AVAILABLITY OF AERIAL INSECTS TO CAGED BLUEGILL SUNFISH,
Southern Illinois Univ., Carbondale.
R. C. Heidinger.
Prog Fish-Cult. 33 (4): 187-192. Illus. 1971.
Identifiers: *Bluegill sunfish, Caged fish, Insects, *Lepomis-Macrochirus, *Ultraviolet light.

Fifteen-watt UV light bulbs were used in modified Pennsylvania light traps to attract food organisms to bluegill sunfish (Lepomis macrochirus Rafinesque) confined in wire cages. The growth rate as influenced by light trap position (therefore, cage position), pond location, and population density, was investigated. Bluegill sunfish stocked in illuminated cages at rates of 5 to 27 fish/m3 showed good growth and high survival. A cage illuminated by a 15-W UV and 25-W incandescent bulb supported 10.4 kg of fish in lowland areas, while a cage at upland areas supported 5.6 kg of fish. Two-fifths of the food organisms entered the cage through the water, and 3/5 entered through the air. During the summer, 187 g of aerial insects were eaten per day by a cage fish at the lowland area and 100 g of aerial insects per day at the upland areas. It was determined that for maximum efficiency, the light traps should be placed more than 3 but less than 15 m apart. There was no significant difference in the quantity of insects caught by a light trap located 3 m from shore and 9 m from shore.--Copyright 1972, Biological Abstracts, Inc.
W72-14140

NORTHERLY LOCALITIES FOR THREE AQUATIC PLANTS, LEMNA TRISULCA L., CERATOPHYLLUM DEMERSUM L., AND MYRIOPHYLLUM SPICATUM L.,
Stockholm Univ. (Sweden). Dept. of Zoology.
C. Holmquist.
Bot Not. 124 (3): 335-342. 1971.
Identifiers: *Alaska, *Aquatic plants, *Canada, Ceratophyllum-Demersum-D, Lemna-Trisulca-M, Localities, Myriophyllum-Specatum-D.

These aquatic plants were found north of their known distribution range on several localities in northern Alaska and northwestern Canada. The new records are accounted for geographically and ecologically. It is suggested that more records will be available once a more systematic search for aquatic plants in arctic areas is performed.--Copyright 1972, Biological Abstracts, Inc.
W72-14141

NOTES ON A RHODESIAN COLONY OF THE RED BISHOP,
P. F. Woodall.
Ostrich. 42 (3): 205-210. 1971.
Identifiers: Behavior, *Breeding birds, Euplectes-Orix, Feeding habits, *Red bishops, *Makabusi River (Rhodesia).

A colony of red bishops Euplectes orix was studied on the Makabusi River, Salisbury. Breeding was well synchronized but late, in association with low Nov. rainfall, and there was a higher percentage of small clutches (c/2) than usual. Nest sites, structure and dimensions are described, and observations are given on intra- and inter-specific behavior among the breeding birds. Territories were spaced at an average density of 1 every 325 m2. Observations on feeding and drinking habits are recorded.--Copyright 1972, Biological Abstracts, Inc.
W72-14142

OBSERVATIONS ON THE FOOD AND FEEDING BEHAVIOR OF THE COMMON BOMBAY CATFISH: TACHYSURUS SONA (HAM),
Central Inland Fisheries Research Inst., Barrackpore (India).
Vijai D. Singh, and M. S. Rege.
J Univ Bombay. 39 (66): 49-57. Illus. 1970.
Identifiers: Behavior, *Bombay catfish, *Feeding habits, Tachysurus-Sona, *Catfish.

T. sona is a predaceous carnivore, becoming 'piscivorous' on attaining a length of 243 mm. It can be inferred that the fish indiscriminately feeds on small sized fishes and crustaceans. The occurrence of sand and mud in the stomach may be due

to occasional bottom feeding.--Copyright 1972, Biological Abstracts, Inc.
W72-14143

ANALYSIS OF THE ENVIRONMENTAL FACTORS IN THE AREA OF DISTRIBUTION OF CHALARODON MADAGASCARIENSIS: THEIR BIOLOGICAL IMPLICATIONS,
Madagascar Univ., Tananarive. Lab. of Zoology.
Charles P. Blanc.
Ann Univ Madagascar Ser Sci Nat Math. 7. 279-306. Illus. 1970. English summary.
Identifiers: *Chalarondon-Madagascariensis, Climatic factors, Environmental factors, *Lizards, *Malagosy.

The detailed comments that were made on the distribution map of Chalarodon madagascariensis made it possible to define, in the climatological study, the factors limiting the range of this species. These are rainfall and sunning. The chalarodons live in the region of Malagasy where solar heat is strongest and rainfall lowest, and where hot climatological conditions range from subarid to semiarid (the maximum temperature is one of the highest in the island). They live in full sunlight. They are typically xerophilous and heliophilous lizards. They are adapted to life in sandy grounds, over which they move about most swiftly and in which they dig their holes. The manner in which sandy grounds are distributed accounts for the varying density within the area. The most characteristic vegetation is xerophilous bush, sparse enough to afford sufficient sunlight to the ground. These lizards do not undergo real hibernation, but only a marked slackening in their activity during winter in the southern hemisphere (dry and cool season). Lastly, this study of the factors of environment describes some aspects of their biology in relation to their ecology (cycles of activity, nutrition, etc.).--Copyright 1972, Biological Abstracts, Inc.
W72-14144

A GUIDE TO THE EXTERNAL SEXING OF SOME WEST AFRICAN FRESHWATER FISHES,
British Columbia Univ., Vancouver. Dept. of Zoology.
J. D. Reynolds.
Ghana J Sci. 11 (1): 3-11. Illus. 1971.
Identifiers: *Bagridae, *Characinidae, *Clariidae, West African fishes, *Polypteridae, *Schilbeidae, Sex.

Methods of sexing West African freshwater fishes using external structural characters were investigated. Literature references to successful external sexing of Characinidae were verified, and Polypteridae and Clariidae appear also to be sexable. New methods to sex siluroid fishes, chiefly of the families Schilbeidae and Bagridae are described. In most cases the external character is not obvious before the fish reaches sexual maturity.--Copyright 1972, Biological Abstracts, Inc.
W72-14145

NATURAL POPULATION DYNAMICS OF PHLEBOTOMINE SANDFLIES IN PANAMA,
Army Medical Research Unit, Panama, APO New York 09826.
B. N. Chaniotis, J. M. Neely, M. A. Correa, R. B. Tesh, and K. M. Johnson.
J Med Entomol. 8 (4): 339-352. Illus. Maps. 1971.
Identifiers: *Panama, Phlebotomine sandflies, *Sandflies.

The population dynamics of phlebotomine sandflies were studied in a Panamanian forest for 69 consecutive wk. Sandfly populations were characterized by high species diversity, spatial heterogeneity and temporal change. Thirty-seven spp. were identified among 60,455 specimens collected. Light traps set near the ground captured 38.7% of the flies collected, 12.5% were caught in arboreal light traps, and 48.8% were aspirated from resting sites on tree trunks and buttresses. Anthropophilic species comprised 31.2% of all specimens, with light traps attracting nearly 2 times as many near the ground as compared to the forest canopy. Collecting stations in 3 distinct biotopes showed identical species compostion but marked quantitative differences. Mature forest was a more productive sandfly habitat than secondary forest and, within mature forest, hilltop biotope was more productive than lowland (stream bed). Sandflies were perennial with marked seasonal fluctuations. Temporal density changes were related to amount and distributional pattern of rainfall which apparently acted by modifying the development conditions in the ground. Dryness of waterlogging of the forest floor, caused by scanty or excessive rainfall, was correlated with reduced adult density. Peak activity was attained during the 1st wk of Aug. with a 2nd peak during the 1st half of Jan. The maximum increase, over the low level in dry season, was about 5-fold for the general population and 8-fold for the anthropophilic species. Seasonal population changes for a number of principal and anthropophilic species are presented.--Copyright 1972, Biological Abstracts, Inc.
W72-14147

STUDIES ON THE MECHANISMS OF ACTION OF THE ANTITRANSPIRANT PHENYLMERCURIC ACETATE, AND ITS PENETRATION INTO THE MESOPHYLL,
Lancaster Univ., Bailrigg (England). Dept. of Biological Sciences.
G. R. Squire, and M. B. Jones.
J Exp Bot. 22 (73): 980-991. Illus. 1971.
Identifiers: *Anti transpirants, Carbon dioxide, Cells, *Commelina-Communis-M, *Phenylmecuric acetate, Mesophyll, Penetration, Photosynthesis, Zea-Mays-M.

Experiments have examined the effect of phenylmercuric acetate (PMA) on the guard cells of Commelina communis. In one series, PMA was applied to the leaf surface; after different time intervals the epidermis was removed and the ability of the stomata to open was determined. In the other series, different concentrations of PMA were included in the medium used for incubating epidermal strips, with which ion-stimulated stomatal opening was assayed. At concentrations of 105 M and above the effect of PMA was severe and the structural integrity of the guard cells was affected; they were unable to accumulate neutral red. At concentrations around 106 M the guard cells were less affected and PMA brought about a transient stimulation of stomatal opening by releasing subsidiary-cell turgor pressure. A solution of 5 x 10-4 M PMA applied to leaves reduced by half the photosynthetic 14CO2 -incorporation into C. communis mesophyll. In Zea mays it increased the CO2 compensation point and also the resistance to diffusion in the gas phase, but there was a proportionately greater increase in the apparent liquid phase resistance. This direct inhibition of mesophyll photosynthesis undermines one of the major objectives of applying antitranspirants, and for this reason it is suggested that PMA is unsuitable for general application to crops.--Copyright 1972, Biological Abstracts, Inc.
W72-14149

PRESENT STATE OF CASTOR FIBER L. POPULATION IN THE UPPER AND MIDDLE FLOW OF THE UBORT RIVER AND PROSPECTS OF ITS ECONOMIC USE (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut Zoologii.
G. M. Panov.
Vestn Zool, 5 (5): 81-82, 1971, English summary.
Identifiers: *Castor-Fiber, Cattle, Economic, Flow, Forage, Middle, *Ubort River, USSR, *Rodents.

The abundance of C. fiber in the upper and middle flow of the Ubort river increased owing to the growth of some beaver families that inhabited the river and migration of animals from the lower flow of the river. At present the Ubort river from Emilchino in the south to the boundary with the Byelorussian SSR in the north is populated with this valuable rodent. In autumn 1969 there were only 220-230 beavers. Further growth in their numbers is limited by the weak forage reserves and negative effect of cattle pasture in the littoral zone.--Copyright 1972, Biological Abstracts, Inc.
W72-14159

ADDITIONS TO THE LIST OF ODONATA OF THE DUTCH WADDEN ISLANDS, WITH AN ACCOUNT OF WATER QUALITY DATA OF LARVAL HABITATS, AND A REVIEW OF THE DRAGONFLY FAUNA OF THE DUTCH AND GERMAN NORTHSEA ISLANDS,
Rijksinstituut voor Veldbiologisch Onderzoek ten Behoeve van het Natuurbehoud, Zeist (Netherlands).
B. Kiauta.
Biol Jaarb, 36: 88-114, Illus, 1968.
Identifiers: Dragonfly, *Dutch Wadden Islands, Fauna, Islands, Larvae, North Sea, *Odonata, *Sympecma fusca.

Previously unpublished records are brought together of Odonata of the Dutch Wadden Islands. Among the species listed Sympecma fusca (van der Linden, 1823) is new to the fauna of the Northsea Islands, Lestes virens (Charpentier, 1825), Coenagrion puella (Linnaeus, 1758), and Ischnura pumilio (Charpentier, 1825) are new to the Dutch Wadden Islands, 2 are added to the list of Terschelling and 12 spp. are new for the fauna of Schiermonnikoog. For the first time records are published for the islands of Vlieland (6) and Ameland (2). Eighteen species are listed altogether.--Copyright 1972, Biological Abstracts, Inc.
W72-14162

SPREAD OF THE ORANGE LILY IN THE RIVER VALLEYS OF LITHUANIA,
Akademiya Nauk Litovskoi SSR, Vilnius. Inst. of Botany.
Y. Y. Strazdaite, and Z. P. Lazdauskaite.
Liet Tsr Mokslu Akad Darb Ser B, 1. 61-67, Map, 1971, English summary.
Identifiers: Briza-Media-M, Ecology, *Lilium-Bulbiferum-M, Lily-M, *Lithuania, *Orange lily, River valleys, Trifolium-Pratense-D.

In natural environments the orange lily (Lilium bulbiferum L.) often grows in the wet river meadows of SW Lithuania and is cultivated all over the republic. The orange lily grows only in the communities Briza media--Trifolium pratense. Such successional communities allow the invasion of garden escapes.--Copyright 1972, Biological Abstracts, Inc.
W72-14168

COMPETITION AND ITS BEARING ON THE FRESHWATER FAUNAS,
Academia R. S. R., Bucharest. Institutul de Biologie.
P. Banarescu.
Rev Roum Biol Ser Zool. 16 (3): 153-164. Illus. 1971.
Identifiers: *Competition, Copepoda, Crabs, Crayfish, *Evolution, *Fauna, Invertebrates, Mussels, Ostariophysi.

The main dominant and competitive groups of freshwater animals are: Ostariophysi among fishes, crabs among Decapoda, Parabathynellidae among Syncarida, Unionaceae (except Hyriidae) among mussels, Diaptomidae among calanoid Copepoda and Streptocephalidae among Anostraca. South-East and East Asia were the main centers of evolution for these groups; North

America was a secondary center for crayfishes and mussels, South America a second center for Ostariophysi. Archaic groups, eliminated by competitive ones, survive mainly in southern continents, especially Africa for fishes and Australia for invertebrates. Some archaic and non-competitive groups lived once also in northern continents, while others seem to have dispersed through direct contact between southern continents.--Copyright 1972, Biological Abstracts, Inc.
W72-14176

DROUGHT RESISTANCE IN SUBALPINE NYMPHS OF SOMATOCHLORA SEMICIRCULARIS SOLYS (ODONATA: CORDULIIDAE),
Illinois Univ., Chicago. Dept. of Biological Sciences.
R. L. Willey, and H. O. Eiler.
Am Midl Nat. 87 (1): 215-221. Illus. 1972.
Identifiers: Aeschna-Interrupta-Interna, Corduliidae, *Drought, Libellula-Quadrimaculata, *Nymphs, Odonata, *Somatochlora-Semicircularis, Subalpine pools, Colorado, Irwin pool (Colo).

S. semicircularis inhabits subalpine pools and water meadows which frequently or regularly dry up in late Aug. and early Sept. Since the nymphs require 4 yr to mature, they must have the ability to survive these periods of drought. Somatochlora nymphs were found under rocks, moss mat, logs and deep in the bases of sedge clumps in Irwin Pond, Colorado, after it had dried up. In the laboratory, nymphs of Somatochlora die after losing the same relative amount of body water content under experimental desiccating conditions as do nymphs of Aeschna interrupta interna and Libellula quadrimaculata. However, it takes the nymphs of Somatochlora almost twice as long to reach this point. Low rate of transpiration in the nymph and early formation of the snow pack over the dry subalpine pond are believed to contribute to the survival of this dragonfly.--Copyright 1972, Biological Abstracts, Inc.
W72-14183

PSYCHROMETRIC APPARATUS FOR BOWEN-RATIO DETERMINATION OVER FORESTS,
British Columbia Univ., Vancouver. Dept. of Soil Science.
For primary bibliographic entry see Field 07B.
W72-14184

2J. Erosion and Sedimentation

A DEVICE FOR COLLECTING IN-SITU SAMPLES OF SUSPENDED SEDIMENT FOR MICROSCOPIC ANALYSIS,
Johns Hopkins University, Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 05A.
W72-13693

PREHISTORIC NEAR-SURFACE SUBSIDENCE CRACKS IN WESTERN FRESHNO COUNTY, CALIFORNIA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W72-13717

PERMEABILITY DISTRIBUTION IN A HOLOCENE DISTRIBUTARY CHANNEL-FILL NEAR LEERDAM (THE NETHERLANDS),
Koninklijke-Shell Exploratie en Produktie Laboratorium, Rijswijk (Netherlands).
K. J. Weber, R. Eijpe, D. Leijnse, and C. Moens.
Geologie en Mijnbouw (Netherlands), Vol 51, No 1, p 53-62, 1972. 14 fig, 8 ref.

Descriptors: *Hydrogeology, *Alluvial channels, *Deltas, *Anisotropy, Stratigraphy, Permeability, Transmissivity, Piezometers, Cores, Sedimentary structures, Groundwater movement.

Channel-fill sand bodies are predominantly composed of a rather regular pattern of medium-scale festoon cross-bed sets, which are formed by the common river-bottom type of transverse-migrating sand ripples with curved crests, as a result of a rather strong unidirectional current. The festoons are elongated in the direction of the current and have a 'trough' or 'spoon'-shaped bottom which is initiated by a so-called bottom-set layer. The internal structure of the cross-bed sets, together with the systematic nature of their orientation, may cause an overall permeability anisotrophy in a channel-fill sand body. Experimental data on unconsolidated distributary channel-fills show that permeability anisotrophy is negligable in such sand bodies. (Knapp-USGS)
W72-13730

RAPID METHOD FOR DETECTION AND CHARACTERIZATION OF STEROIDS,
California Univ., Berkeley. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-13781

ATLANTIC CONTINENTAL SHELF AND SLOPE OF THE UNITED STATES-PETROLOGY OF THE SAND FRACTION OF SEDIMENTS, NORTHERN NEW JERSEY TO SOUTHERN FLORIDA,
Woods Hole Oceanographic Institution, Mass.
J. D. Milliman.
Available from Sup Doc, GPO, Washington, DC 20402-Price $5.00 paper copy, including plates. Geological Survey Professional Paper 529-J, 1972. 40 p, 16 fig, 9 plate, 5 tab, 122 ref.

Descriptors: *Continental shelf, *United States, *Atlantic Ocean, *Petrology, *Sands, Sediments, Continental slope, Hydrologic data, Data collections, Sedimentology, Sediment transport, Maps, Geochemistry, Geology.

This study was part of the general investigation of the east coast (USA) continental shelf, slope, and upper rise undertaken by the Woods Hole Oceanographic Institution and the U.S. Geological Survey. Surface sediments on the continental margin from northern New Jersey to southern Florida can be divided into different sediment types on the basis of their testure and composition. Most of the continental shelf north of Cape Hatteras is covered with a relict low-carbonate felspathic sand. Shelf sediments south of Cape Hatteras are characterized by relatively high carbonate and low feldspar contents, the result of warm coastal waters and southern river sedimentation. Carbonate components include mollusks, coralline algae, barnacles, and oolite. Sediments immediately adjacent to large Piedmont rivers, however, tend to have relatively low carbonate and relatively high feldspar contents. The most impressive characteristic of the sediments of the continental margin is that most are relic or residual. Nine data maps are included under a separate cover. (Woodard-USGS)
W72-13830

TIDAL VARIATION OF THE SUSPENDED SEDIMENT SIZE DISTRIBUTION AT A STATION IN UPPER CHESAPEAKE BAY,
Maryland Fish and Wildlife Administration, Annapolis.
For primary bibliographic entry see Field 02L.
W72-13837

GEOLOGIC CROSS SECTIONS DERIVED FROM SEISMIC PROFILES AND SEDIMENT CORES FROM SOUTHERN LAKE MICHIGAN,
Illinois State Geological Survey, Urbana.
J. A. Lineback, D. L. Gross, and R. P. Meyer.
Illinois Geological Survey Environmental Geology Notes, No 54, August 1972. 43 p, 8 fig, 8 ref.

Descriptors: *Sedimentology, *Geology, *Lake Michigan, *Cross-sections, *Geomorphology, Sampling, Cores, Data collections, Pleistocene epoch, Analytical techniques, Sediment distribution, Profiles.
Identifiers: *Seismic profiles.

High-resolution seismic profiles and cores of bottom sediments were used in the construction of geologic cross sections of southern Lake Michigan. Major stratigraphic units of the Pleistocene and the surface of the underlying Paleozoic bedrock can readily be distinguished. Cross section in the northern part of southern Lake Michigan (near Milwaukee, Wisconsin) cross the Midlake High and show high relief on the bedrock surface, differentiate a thick glacial till, and indicate that in this area the Lake Michigan Formation is confined to low spots on the lake floor. A north-south cross section of the area shows a thick terminal moraine-like accumulation of till south of Milwaukee that pinches out southward. In the central part of the southern lake basin, the Lake Michigan Formation thins southward. The formation is thick along the eastern shore but absent in the southwestern corner of the lake. (Woodard-USGS)
W72-13844

SUSPENDED SEDIMENT DATA SUMMARY MARCH 1966-MAY 1967, UPPER CHESAPEAKE BAY (TOLCHESTER TO HAVRE DE GRACE),
Maryland Fish and Wildlife Administration, Annapolis.
For primary bibliographic entry see Field 02L.
W72-13849

TOPOGRAPHY AND RECENT SEDIMENTS OF THE LITTORAL ZONE OF SOVIET FAR EASTERN SEAS (OSOBENNOSTI FORMIROVANIYA REL'YEFA I SOVREMENNYKH OSADKOV PRIBREZHNOY ZONY DAL'NEVOSTOCHNYKH MOREY SSSR).

Izdatel'stvo 'Nauka', Moscow, 1971. 184 p.

Descriptors: *Geology, *Geomorphology, *Topography, *Shores, *Coasts, Islands, Sediments, Sedimentation, Sediment distribution, Sediment sorting, Particle size, Aggradation, Abrasion, Mineralogy, Meteorology, Climatology, Orography, Littoral, Underwater, Sea level, Histograms.
Identifiers: *USSR, Chuckchee Sea, Sea of Okhotsk, Kamchatka, Kuril Islands, Shore processes, Shoreline development, Coastal features, Eustatic.

This three-part monograph examines the geomorphology and dynamics of the littoral zone of Far Eastern seas bordering the Soviet Union and the lithology of recent sediments deposited in the near-shore environment. Regions investigated include the coasts of the Chukot Peninsula, Kamchatka, and Kuril Islands and the shores of the Sea of Okhotsk and Peter the Great Bay at the south end of the Maritime Territory. Coastal evolution of each region is described in terms of the topographic features resulting from marine depostion or erosion. (Josefson-USGS)
W72-13860

FAIRPORT HARBOR, LAKE COUNTY, OHIO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 04A.
W72-13961

LORAIN HARBOR, OHIO (MAINTENANCE) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 04A.
W72-13962

WINNEBAGO-BEAN CREEK WATERSHED, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-13966

SORPTION-DESORPTION REACTIONS OF MERCURY WITH SUSPENDED MATTER IN THE COLUMBIA RIVER,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 05B.
W72-13972

DISTRIBUTION PATTERNS FOR SOME PARTICULATE AND DISSOLVED TRACE METALS WITHIN AN ACTIVE GLACIAL FJORD,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 05B.
W72-13973

ADSORPTION-DESORPTION EQUILIBRIA OF SOME RADIONUCLIDES IN SEDIMENT-FRESHWATER AND SEDIMENT-SEAWATER SYSTEMS,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco).
For primary bibliographic entry see Field 05B.
W72-13974

TRANSPORT AND DEPLETION OF RADIONUCLIDES IN THE COLUMBIA RIVER,
Battelle-Pacific Northwest Labs., Richland, Wash. Radiological Sciences Dept.
For primary bibliographic entry see Field 05B.
W72-13975

CONCENTRATIONS AND DISTRIBUTIONS OF LONG-LIVED FALLOUT RADIONUCLIDES IN OPEN OCEAN SEDIMENTS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05B.
W72-13980

ANOMALOUS TH228/TH232 AND TH230/232 ACTIVITY RATIOS IN BACKWATER SEDIMENTS ALONG THE WEST COAST OF INDIA.
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
For primary bibliographic entry see Field 05B.
W72-13982

WEATHERING OF BASALTIC TEPHRA ON THE ISLAND OF HAWAII,
California Univ., Berkeley. Dept. of Geology and Geophysics.
R. L. Hay, and B. F. Jones.
Geological Society of America Bulletin, Vol 83, No 2, p 317-332, February 1972. 5 fig, 5 tab, 28 ref.

Descriptors: *Weathering, *Volcanoes, *Hawaii, *Basalts, Leaching, Igneous rocks, Water chemistry, Temperature, Rainfall, Precipitation (Atmospheric).
Identifiers: *Tephra, *Volcanic ash.

Three basaltic tephra deposits of Kilauea were studied in order to determine the nature and amount of weathering as a function of age and climate. The principal weathering products of glass are palagonite and clay. Montmorillonite and calcite are weathering products of the Pahala Ash in the drier areas; gibbsite has formed at rainier sites. Plagioclase, pyroxene, and olivine are weathered only in the Pahala Ash. Chemical changes on weathering of the tephra deposits vary as a function of climate. From comparative analysis of unaltered and altered solids, SiO2 and Na + K + Ca + Mg seem to be lost under heaviest rainfall in average proportions as high as 2:1; in the driest areas they have been leached in the ratio of about 1:3. In an area of intermediate rainfall, SiO2 and Na + K + Ca + Mg are lost in an average ratio of 3:2, as shown by chemical composition of both solids and interstitial waters. (Knapp-USGS)
W72-14014

NONANTECEDENT DEVELOPMENT OF TRUCKEE RIVER CANYON, NORTHERN CARSON RANGE, NEVADA AND CALIFORNIA,
Texas Univ., El Paso. Dept. of Geological Sciences.
E. M. P. Lovejoy.
Geological Society of America Bulletin, Vol 83, No 3, p 885-894, March 1972. 3 fig, 23 ref.

Descriptors: *Erosion, *Geomorphology, *Structural geology, *Canyons, Valleys, Terrain analysis, Topography, Water gaps, *Nevada, Drainage patterns (Geologic), California.
Identifiers: Carson Range (Nev), *Truckee River (Nev).

Truckee River crosses northern Carson Range in a gorge 3000 ft deep, passing east from Truckee Valley, elevation 6400 ft, to Truckee Meadows, elevation 4400 ft. A nonantecedent origin for this gorge is suggested, based on headward erosion in the easily eroded pyroclastic rocks which lie on the resistant Sierran basement intrusive rocks. Headward erosion together with stream capture enabled the Truckee River to extend west of the original range divide, where it incorporated drainage of the western flank. Erosion then continued into Truckee Valley, thus crossing the Carson Range nonantecedently. Therefore, Truckee River Canyon may not be evidence of postandesite uplift, either by warping or faulting, of the Carson Range. (Knapp-USGS)
W72-14015

INVERSE RELATION BETWEEN FORESHORE SLOPE AND MEAN GRAIN SIZE AS A FUNCTION OF THE HEAVY MINERAL CONTENT,
Wisconsin Univ., Milwaukee. Dept. of Geography.
R. N. Dubois.
Geological Society of America Bulletin, Vol 83, No 3, p 871-876, March 1972. 4 fig, 10 ref.

Descriptors: *Beaches, *Particle size, *Mineralogy, *Sands, *Sediment sorting, Sedimentation, Sediment distribution, Distribution patterns, Geomorphology, Slopes, Surf, Waves (Water).
Identifiers: *Heavy minerals, *Foreshore slope.

Along the sandy beach of Terry Andrae State Park on Lake Michigan, an inverse relationship exists between foreshore slope angle and mean grain size. Mean grain size decreases as the heavy mineral content increases. Grain size, wave steepness, and wave length affect the foreshore slope angle. The heavy mineral content in the mid-foreshore is proposed as an active variable that also influences the foreshore slope angle. (Knapp-USGS)
W72-14016

BROWN AND GRAY SANDS ON THE VIRGINIA SHELF: COLOR AS A FUNCTION OF GRAIN SIZE,
Old Dominion Univ., Norfolk, Va. Inst. of Oceanography.
D. J. P. Swift, and W. R. Boehmer.
Geological Society of America Bulletin, Vol 83, No 3, p 877-884, March 1972. 4 fig, 2 tab, 22 ref. DACW-72-69-C-0016 NSF Grant GA-13837.

Descriptors: *Sands, *Continental shelf, *Water chemistry, *Oxidation, *Iron, Color, *Virginia, Weathering, Permeability, Aeration, Water circulation, Surf, Waves (Water), Color reactions.
Identifiers: *Iron-stained sands.

Brown iron-staining on coarse shelf sands is evidence of subaerial weathering, either in the source area or at the depositional site. However, iron-staining can occur subaqueously, as well. A close correlation was found between grain size and color on the inner Virginia shelf, with finer sands being olive-gray, and coarser sands being brown. The sand-grain surfaces are in chemical equilibrium with their environment. The coarser sands are permeable, and are kept oxygenated by wave surge. The finer sands are relatively impermeable, and are reduced by interstitial organic matter. Brown iron-staining is not a definitive criteria for a relict origin or subaerial exposure of shelf sand. (Knapp-USGS)
W72-14017

MORPHOMETRIC ANALYSIS OF POLYGONAL KARST IN NEW GUINEA,
Trinity Coll., Dublin (Ireland).
P. W. Williams.
Geological Society of America Bulletin, Vol 83, No 3, p 761-796, March 1972. 19 fig, 4 tab, 78 ref.

Descriptors: *Karst, *Geomorphology, *Karst hydrology, *Topography, *Hydrogeology, Erosion, Structural geology, Terrain analysis, Sinks, Slopes, Valleys, Limestones.
Identifiers: *New Guinea, *Polygonal karst.

The morphometry of humid tropical karst was studied in eight districts in east New Guinea. Closed depressions completely pit the landscapes and, when delimited on the basis of their topographic divides, form a cellular network termed polygonal karst. The stream-sinks associated with the depressions have dispersion that tend to be uniform. Morphologic parameters have a well-defined and generally similar form of association in each of the sample districts. Statistical range tests permit the identification of three polygonal karsts: pinnacle, conic, and linear styles. The conic and linear styles correspond roughly to 'cone karst' and 'directed karst,' respectively. A proposed growth model for polygonal karst envisages scattered small depressions on an uplifted surface expanding and capturing smaller neighbors until the entire surface is occupied by adjoining polygonal depressions. The boundaries of the depressions are largely stabilized by competition, and growth of the depression is also limited by the permeability of karstified rock, with large depressions breaking into smaller units if a certain size is exceeded. Once a cellular polygonal karst is established, its geometry undergoes only minor modification through time, unless altered by an important environmental factor. (Knapp-USGS)
W72-14018

CHRONOLOGY OF A KETTLE-HOLE PEAT BOG, CHERRYFIELD, MAINE,
Wisconsin Univ., Madison. Dept. of Geology and Geophysics.
D. M. Mickelson, and H. W. Borns, Jr.
Geological Society of America Bulletin, Vol 83, No 3, p 827-832, March 1972. 3 fig, 16 ref. NSF Grant GA-1157.

Descriptors: *Peat, *Bogs, *Maine, *Deltas, *Sedimentation, *Pleistocene epoch, Radioactive dating, Carbon radioisotopes, Sedimentation rates, Sedimentation, Sedimentology, Sea level, Paleohydrology.
Identifiers: Cherryfield (Maine).

Parts of coastal and central Maine underwent marine submergence between approximately 13,500 and 12,500 yrs ago. An ice-contact marine delta near Cherryfield, Maine, was formed during this time. Ten radiocarbon dates of basal peat sam-

ples from a kettle hole on the delta ranged from 5,310 plus or minus 100 yrs B.P. at a depth of 2.21 m to 9,170 plus or minus 160 yrs B.P. at a depth of 5.28 m. The radiocarbon dates indicate a time lag of approximately 2,000 yrs between the formation of the delta and the earliest deposition of organic matter in the kettle hole. (Knapp-USGS)
W72-14019

RIVER DISCHARGE INTO AN ICE-COVERED OCEAN AND RELATED SEDIMENT DISPERSAL, BEAUFORT SEA, COAST OF ALASKA,
Geological Survey, Menlo Park, Calif.
E. Reimnitz, and K. F. Bruder.
Geological Society of America Bulletin, Vol 83, No 3, p 861-866, March 1972. 7 fig, 6 ref.

Descriptors: *Sedimentation, *Deltas, *Sea ice, *Sediment transport, *Alaska, Ice breakup, Ice cover, Sediment load, Dispersion, Scour, Deposition (Sediments).
Identifiers: *Beaufort Sea.

Along the Beaufort Sea coast of Alaska in 1970 during the first few days following river breakup, the fast sea ice was inundated by fresh-water overflow for as far as 10 km from shore. The water drained through widely distributed drain holes in the ice, creating scour depressions in the sea bottom. Later the rivers flowed directly into growing open-water areas surrounding distributary mouths and thence seaward below the fast ice. The presence of the sea ice during the river flood greatly restricts the cross-sectional area available for the seaward flow out to at least the 2-m contour, where the bottom slope suddenly steepens. At the Colville Delta, the 2-m bench extends 5 to 8 km from shore and presumably represents an area of sediment by-passing. Only insignificant amounts of sediment are rafted away from arctic Alaska's deltas during the final breakup of the sea ice. (Knapp-USGS)
W72-14020

LONGITUDINAL PROFILES OF EPHEMERAL STREAMS IN SOUTHEASTERN ARIZONA,
Princeton Univ., N.J. Dept. of Geological Sciences.
For primary bibliographic entry see Field 02E.
W72-14021

ALLUVIAL CUTOFF DATING FROM SUBSEQUENT GROWTH OF A MEANDER,
Iowa State Univ., Ames. Engineering Research Inst.
R. L. Handy.
Geological Society of America Bulletin, Vol 83, No 2, p 475-480, February 1972. 3 fig, 1 tab, 11 ref.

Descriptors: *Meanders, *Alluvial channels, *Cutoffs, *Channel morphology, *Stream erosion, Mapping, Surveys, Flood plains, Geomorphology, Discharge (Water), Sediment load, Scour, Erosion, *Iowa.
Identifiers: *Des Moines River (Iowa).

A meander in the Des Moines River grew rapidly following a channel cutoff in about 1880, after which the rate of growth slowed gradually as the channel approached the edge of the meander belt. A first-order rate equation describes the distance of the river from the edge of the meander belt at any time after cutoff. The initiating river cutoff occurred after a meander loop impinged on a pleistocene terrace and became stationary. Shortening of a river meander by a cutoff causes a local increase in gradient and renewed meander activity. (Knapp-USGS)
W72-14025

GROWTH OF A TALUS CONE IN THE WESTERN CHUGACH MOUNTAINS, ALASKA,
Geological Survey, Menlo Park, Calif.
S. H. B. Clark, H. L. Foster, and S. R. Bartsch.
Geological Society of America Bulletin, Vol 83, No 1, p 227-230, January 1972. 5 fig, 2 ref.

Descriptors: *Talus, *Mass wasting, *Earthquakes, *Alaska, *Rockslides, Erosion, Landslides, Sedimentation, Surveys.
Identifiers: *Chugach Mountains (Alaska).

A significant increase in the size of a talus cone near the terminus of Eklutna Glacier during the 6 yrs following the 1964 Alaska earthquake is shown by comparison of photographs taken in 1964 and 1970. Calculations from approximate measurements indicate that about 1.7 million cu yds of rock has been added to the cone since 1964. This growth has been the result of intermittent rockfalls which began after the 1964 earthquake and were continuing in 1970. Rockfalls in other places in the same area were initiated by the earthquake, but did not continue at a rate sufficient to produce measurable change in the talus. Observations on the ridge above the active talus cone suggest that the configuration of the cliff, fracturing and loosening of the rock at the time of the earthquake, and possible land movements resulted in a uniquely unstable area. The instability may be sufficient to account for the continuation of an unusually large number of rockfalls. (Knapp-USGS)
W72-14026

DEVELOPMENT OF THE GAUYA RIVER VALLEY (RAZVITIYE DOLINY REKI GAUYA),
All-Union Research Inst. of Marine Geology and Geophysics, Riga (USSR).
O. P. Aboltyn'sh.
'Zinatne', Riga, 1971. 108 p.

Descriptors: *Geology, *Geomorphology, *Topography, *Valleys, *Rivers, River basins, Terraces (Geologic), Surfaces, Water levels, Channels, Shores, Flood plains, Alluvium, Sedimentation, Aggradation, Erosion, Glaciation, Gelogic mapping, Correlation analysis.
Identifiers: *USSR, *Latvia, *Gauya River, *Terrace correlation, *Base level of erosion, Postglacial, Paleogeography, Tectonics.

The Gauya River, which rises in the Vidzeme Hills and flows in a winding course to the Gulf of Riga, is the second longest river in Latvia. The length of the river is 460 km, and the area of the drainage basin is 8,905 sq km. Average annual runoff is 2.4 cu km, with maximum discharge occurring in spring and fall months. The structure, morphology, and history of development of the river valley are investigated for correlation of terraces in the valley with shorelines of basins, which were the base levels of erosion during terrace formation. Attention is focused on the structure of alluvial floodplain terraces formed in the postglacial period by the river's hydrologic regime, water-level fluctuations of the Baltic, and tectonic conditions in the river basin. Present degradational and aggradational processes are represented by slow downcutting of the river, accompanied by valley widening. (Josefson-USGS)
W72-14034

PLATINUM MINERALS IN QUATERNARY SEDIMENTS BETWEEN THE ANABAR AND OLENEK RIVERS (PLATINOVYYE MINERALY CHETVERTICHNYKH OTOLOZHENIY ANABARO-OLENEKSKOGO MEZHDURECH'YA),
Akademiya Nauk SSSR, Yakutsk. Institut Geologii.
B. R. Shpunt.
Geologiya Rudnykh Mestorozhdeniy, Vol 12, No 2, p 123-126, March-April 1970. 2 fig, 1 tab, 3 ref.

Descriptors: *Sediments, *Sedimentology, *Mineralogy, *Metals, *Quaternary period, Rivers, River basins, Watersheds (Divides), Interfluves, Alluvium, Sands, Rocks, Erosion, Panning, Placer mining, X-ray analysis.
Identifiers: *USSR, *Yakutsk ASSR, *Platinum, Mineral properties, Pebbles.

The presence of platinum minerals in Quaternary sediments of the Buolkalakh, Khatygyn-Uelete, and Kangalas-Uele River basins in northwestern Yakutsk ASSR was established in field studies conducted both by the Yakutsk Geological Administration in 1966 and by the Scientific Research Institute of Arctic Geology in 1966-68. Characteristically low in heavy minerals, Middle-Upper Quaternary lacustrine-alluvial sediments between the Anabar and Olenek Rivers contain 40%-60% almandine, 25%-50% ilmenite, 4%-17% epidote, 5%-8% zircon, 1%-3% rutile, 0.5%-3% magnetite, and 0.5%-2% sphene. Maximum concentrations of platinum minerals, reaching weighable quantities, occur in the lowermost part of the sedimentary profile next to the base of ferruginized pebblestone. High concentrations of platinum minerals are generally associated with high concentrations of chromite, spinel, pyroxenes, magnetite, gold, diamonds, pyrope, and picroilmenite. Erosion of the Middle-Upper Quaternary platinum-bearing sediments correlates with the appearance of platinum minerals in the alluvium of the present-day drainage system. (Josefson-USGS)
W72-14035

NEW INVESTIGATIONS OF SHORE PROCESSES (NOVYYE ISSLEDOVANIYA BEREGOVYKH PROTSESSOV).
Akademiya Nauk SSSR, Moscow. Okeanograficheskaya Komissiya.

'Nauka', Moscow, 1971. 208 p.

Descriptors: *Shores, *Coasts, *Geomorphology, *Topography, *Sedimentation, Sediments, Erosion, Slopes, Beaches, Sand bars, Terraces (Geologic), Deltas, Estuaries, Tides, Winds, Currents (Water), Waves (Water), Littoral, Piers, Geologic time.
Identifiers: *USSR, *Baltic Sea, *White Sea, *Black Sea, *Shore processes, Shoreline development, Longshore currents, Wind waves, Postglacial, Paleogeography.

This collection contains 17 papers devoted primarily to recent investigations of the morphology and dynamics of shores along the Baltic, White, and Black Seas and of coastal regions of the United Arab Republic and Cuba. Individual topics include: (1) dynamics and morphology of shores of the Cheleken Peninsula off the west coast of the Turkmen Republic; (2) development of submerged coasts; (3) dynamics and structure of shores of the Chuckchee Sea; (4) growth of the shoreline of the Nile River Delta; (5) sedimentation in the White Sea in Late Postglacial time; (6) topography and bottom sediments of the northern coast of Cuba near the Sabana and Camaguey Archipelagoes; (7) topography of an underwater slope composed of shell material; (8) techniques and results of pier measurements of coastal currents; (9) topography and sediments in the littoral zone of the Isle of Pines in the northwestern Carribean; (10) investigations of the movement of Black Sea sediments parallel to the shores of the Georgian Republic; (11) manifestations of wind-wave refraction in the dynamics of marine shorelines; and (12) character of summer storm waves in the littoral zone of the eastern Baltic. (Josefson-USGS)
W72-14036

SOIL EROSION STUDIES IN THE PRESNOVSKII SOVKHOZ IN THE PAVLODAR OBLAST, (IN RUSSIAN),
T. K. Dosmukhamedov.
Tr Inst Pochvoved Akad Nauk Kaz SSSR. 29: 100-164. 1970.
Identifiers: Fallow, Pavlodar Oblast, Presnovskii-Sovkhoz, *Soil erosion, Strip cropping, USSR.

Effective practices for protection of soil against deflation are stripcropping (with strips of 100 m on weakly deflated and 50 M on moderately deflated

soils) and moldboardless plowing on moderately and weakly deflated soils, and solid regrassing on heavily deflated soils. Strip-sown fallow is also effective.--Copyright 1972, Biological Abstracts, Inc.
W72-14171

WATER EROSION OF SOILS ON THE RIGHT BANK OF THE SELENGA RIVER, (IN RUSSIAN),
A. D. Ivanov, and I. S. Malyshev.
Tr Buryat Inst Estestv Nauk Buryat Fil Sib Otd Akad Nauk SSSR. 8. 155-172.
Identifiers: Banks, Chernozem, *Soil erosion, Forest, *Selenga River, Soils, USSR.

Data are given on the genesis, distribution, nature of erosion processes and erosive flows in agricultural districts of the Buryat ASSR. The geomorphological and lithological aspects in the development of erosion by water are described. Soil erosion districts are delimited in the zone of prevailing water erosion of chernozem, chestnut and gray forest soils.--Copyright 1972, Biological Abstracts, Inc.
W72-14175

2K. Chemical Processes

WAX-BOUND LEAD DIOXIDE POTENTIOMETRIC ELECTRODE AND APPLICATIONS TO CHELOMETRIC TITRATION,
Wisconsin Univ., Milwaukee. Dept. of Chemistry, and Wisconsin Univ., Milwaukee. Lab. for Surface Studies.
For primary bibliographic entry see Field 05A.
W72-13676

GROUND- WATER IN KEARNY COUNTY, SOUTHWESTERN KANSAS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-13715

WATER-QUALITY RECONNAISANCE OF THE LOWER SANTA ANA RIVER CANYON, SOUTHERN CALIFORNIA,
Geological Survey, Menlo Park, Calif.
G. A. Irwin, and W. R. Powers, III.
Geological Survey Open-file Report, April 17, 1972. 18 p, 5 fig, 5 tab, 9 ref.

Descriptors: *Water quality, *Chemical analysis, *Groundwater, *Surface waters, *California, Hydrogeology, Aquifers, Streams, Sampling, Data collections, Streamflow, Flow characteristics, Water wells, Dissolved solids, Sulfates, Coliforms, Pesticides, Nitrogen, Phosphorus.
Identifiers: *Santa Ana River Canyon (Calif).

From July through December 1970, a water-quality reconnaissance was made of a 6.6-mile reach of the lower Santa Ana River (Southern California) from the gage below Prado Dam to the Santa Ana Valley Irrigation District intake. Concentrations of dissolved solids in the river increased downstream an average of 17 milligrams per liter, or 2.1 percent. The most conspicuous ionic change was the sulfate concentration, which increased 8.0 percent downstream. Groundwater in Aliso and Gypsum Canyons contained concentrations of dissolved solids much higher than those of the river water; groundwater in Wardlow Wash contained concentrations of dissolved solids lower than those of the river water. Coliform bacteria and pesticide concentrations in the river exceeded recommended health and environmental standards. Concentrations of nitrogen and phosphorus, which are primary nutrients for autotrophic plant growth, were high in the river water; however, excessive plant growth was not observed. (Woodard-USGS)
W72-13720

CONTRIBUTION TO THE GEOCHEMISTRY OF GROUNDWATER IN NORTHERN GERMANY,
Geologisches Landesamt Hamburg (West Germany).
E. P. Lohnert.
Geologie en Mijnbouw (Netherlands), Vol 51, No 1, p 63-70, 1972. 5 fig, 17 ref.

Descriptors: *Saline water systems, *Geochemistry, *Hydrogeology, *Saline water, Water chemistry, Chlorides, Sulfates, Water supply.
Identifiers: *Germany.

Moderately saline groundwaters, usable for drinking and industrial purposes, occur in northern Germany at depths of approximately 500 meters below the surface. Apart from local saline water intrusions along the North Sea coast and rivers, the saline components of groundwater are derived from deep groundwaters which are related to salt bodies mainly of Zechstein age. Sulfate waters are found in the immediate vicinity of salt domes. Chloride salt waters and brines are also found further away from the salt bodies, and show indications of reduction and base-exchange. A chemical classification of groundwater is proposed. It uses the absolute as well as the relative contents of ions. (Knapp-USGS)
W72-13725

TUNABLE INFRARED LASER SPECTROSCOPY OF ATMOSPHERIC WATER VAPOR,
Massachusetts Inst. of Tech., Lexington. Lincoln Lab.
For primary bibliographic entry see Field 02B.
W72-13732

WATER QUALITY OF STREAMS IN THE NESHAMINY CREEK BASIN, PENNSYLVANIA,
Geological Survey, Washington, D.C.
E. F. McCarren.
Available from GPO, Washington, DC 20402, Price-30 cents. Geological Survey Water-Supply Paper 1999-0, 1972. 33 p, 7 fig, 4 tab, 20 ref.

Descriptors: *Water resources development, *Watershed management, *Water quality, *Land development, *Pennsylvania, Streamflow, Hydrologic data, Basic data collections, Streams, Water demand, Urbanization, Water quality control, Chemical analysis, Water supply, Water utilization, Water analysis, Groundwater resources.
Identifiers: *Neshaminy Creek basin (Penn).

The Neshaminy Creek, a tributary of the Delaware River, drains 236.5 square miles of rural countryside in Bucks and Montgomery Counties in southeastern Pennsylvania. The perennial flow of fresh water in Neshaminy Creek is used for public supply and recreation. In the lower half of the drainage basin, the average discharge of the main stream exceeds 146 million gallons per day, part of which is regularly diverted and moderately treated for distribution to consumers living in the suburbs of Philadelphia. The unabated growth of nearby metropolitan areas and the multiplying needs for water and open space for water storage and recreation in southeastern Pennsylvania have become impelling forces that mark the Neshaminy valley watershed for continued development of its land and water resources. There is a wide variance in water quality between the West Branch and North Branch of the Neshaminy. However, there is no significant difference between the chemical composition of the Little Neshaminy Creek and the main strem before they come together at Rushland. Just beyond their confluence the main stream has drained more than half its total drainage area. The average flow of the stream at this location is about 85% of the average flow at Langhorne. (Woodard-USGS)
W72-13737

A TECHNIQUE FOR CURIE POINT PYROLYSIS GAS CHROMATOGRAPHY OF COMPLEX BIOLOGICAL SAMPLES,
Stichting voor Fundamenteel Onderzoek der Materie, Amsterdam (Netherlands). Instituut voor Atoom en Molecuulfysica.
For primary bibliographic entry see Field 05A.
W72-13761

GAS LIQUID CHROMATOGRAPHIC ANALYSIS OF HYDROCARBON MIXTURES. A REPORT ON THE WORK OF THE INTERNATIONAL CONFERENCE OF BENZOLE PRODUCERS,
International Conference of Benzole Producers, Paris (France).
For primary bibliographic entry see Field 05A.
W72-13771

MEASUREMENTS OF VERY LOW OXYGEN TENSIONS IN UNSTIRRED LIQUIDS,
Waterloo Univ. (Ontario). Dept. of Physics.
For primary bibliographic entry see Field 05A.
W72-13785

PRECISION OF ELECTRICAL DETECTION MEASUREMENTS OF POWDERED SAMPLES IN SPARK SOURCE MASS SPECTROMETRY,
Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-13787

METHOD FOR DETERMINATION OF MERCURY IN BIOLOGICAL MATERIALS BY NEUTRON ACTIVATION ANALYSIS,
National Bureau of Standards, Washington, D.C. Activation Analysis Section.
For primary bibliographic entry see Field 05A.
W72-13788

DETERMINATION OF FLUORIDE IN VEGETATION USING THE SPECIFIC ION ELECTRODE,
Diamond Shamrock Chemical Co., Baltimore, Md. Chemetals Div.
For primary bibliographic entry see Field 05A.
W72-13789

EMISSION SPECTROMETRIC DETERMINATION OF TRACE AMOUNTS OF MERCURY,
Colorado State Univ., Fort Collins. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-13790

SEMIINTEGRAL ELECTROANALYSIS: THEORY AND VERIFICATION,
Trent Univ., Peterborough (Ontario).
M. Grenness, and K. B. Oldham.
Analytical Chemistry, Vol. 44, No. 7, p 1121-1129, June 1972. 9 fig, 6 tab, 12 ref.

Descriptors: *Electrodes, *Chemical analysis, Electrochemistry, Analytical techniques, Anions, Cations, Cadmium, Instrumentation, Computer programs, Mathematical studies, Analog computers, Kinetics.
Identifiers: *Electroreduction, Electroanalysis, Semiintegral electroanalysis, Mercury electrodes, Voltammetry.

The theory of a new analytical method, semiintegral electroanalysis, is described in detail and an experimental verification of the theory is presented. The theory describes the properties of m, the semiintegral of the faradaic current which flows when complete diffusion control follows a preexisting equilibrium. According to the predictions of the theory, m will be proportional to the concentration of the electroactive species, to the

square root of its diffusion coefficient, to the number of electrons involved, and to the area of the electrode. The theory has been verified. Studies using the reduction of cadmium and 02 at a mercury electrode demonstrate that the semiintegral electroanalysis method is valid for the measurement of concentrations and diffusion coefficients, and possess a number of novel and potentially attractive features. The advantages of the technique are attributed to the independence of the voltammetry from time or frequency. This leads to the independence of m (tau) in the form of the applied signal and permits a large series resistor in the circuit without impairing the analysis. An analog technique permitting direct measurement of m (t) is being developed, which will give semiintegral electroanalysis a marked advantage over other voltammetric methods. (Mortland-Battelle)
W72-13791

ANALYTICAL USES OF CHARGE-TRANSFER COMPLEXATION: SPECTROPHOTOMETRIC METHOD FOR IODIDE IN WATER,
Edgewood Arsenal, Md.
For primary bibliographic entry see Field 05A.
W72-13792

SPECTROPHOTOMETRIC DETERMINATION OF TRACE QUANTITIES OF IRON (III) BY AN EXCHANGE REACTION WITH METAL ACETYLACETONATES,
Assiut Univ. (Egypt). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-13793

VOLTAMMETRY IN METHANOL, ETHANOL, AND SULFOLANE AS SOLVENTS,
Pittsburgh Univ., Pa. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-13794

VERSATILE COLORIMETRIC COULOMETER,
Honeywell Research Center, Hopkins, Minn.
W. D. Ellis, and D. T. Baker.
Analytical Chemistry, Vol. 44, No. 7, p 1330-1331, June 1972. 1 fig, 3 ref.

Descriptors: *Colorimetry, *Laboratory equipment, *Aqueous solutions, Separation techniques, Iodine, Chemical analysis, Ions, *Iodides, Halogens, Oxidation, Chemical reactions, Instrumentation, Optical properties, Measurement.
Identifiers: *Coulometer, Arsenite, Sensitivity, Absorbance, Detection limits.

The colorimetric coulometer based on the oxidation of the iodide ion to iodine is simpler, more sensitive and versatile than those previously described. The procedure for using this equipment involves adding 2.5 ml of a known concentration of KI into a cuvette containing a platinum working electrode and a nickel wire auxiliary electrode. The electrodes are placed out of the optical path with a constant current being passed through the cell for a specified time. The solution is stirred and the absorbance measured with a spectrophotometer at 287 nm. The electrochemical parameters are controlled with a NIL electrolab unit. For experiments on the timer version of the coulometer, a controlled, constant current was passed through a solution containing potassium iodide, sodium bicarbonate, and arsenite, and the signal monitored. The precision of the timer was 0.5 percent; the overall precision of the method was about 1.0 percent. The advantage of the cell described is that it requires no separate auxiliary electrode compartment and it can be used as a one-shop cell with stirring and readout at the end of an experiment or as a stirred cell in a spectrophotometer to continuously monitor the number of coulombs passed through the cell. The detectability of the coulometer was found to be 13.5 millicoulombs. (Snyder-Battelle)
W72-13802

MICRODETERMINATION OF CARBON, HYDROGEN, NITROGEN AND OXYGEN IN PETROLEUM COMPOUNDS WITH AN AUTOMATIC ELEMENTAL ANALYZER,
Sun Oil Co., Marcus, Hook, Pa.
For primary bibliographic entry see Field 05A.
W72-13805

TITRIMETRIC DETERMINATION OF TRACE SULFUR IN PETROLEUM USING A LEAD ION SELECTIVE ELECTRODE,
Sun Oil Co., Marcus Hook, Pa.
For primary bibliographic entry see Field 05A.
W72-13806

A COMPUTERIZED SYSTEM FOR STORING, RETRIEVING, AND CORRELATING NMR DATA,
Hercules Research Center, Wilmington, Del.
For primary bibliographic entry see Field 07C.
W72-13808

ANOMALOUS WATER,
Tyco Labs. Inc., Waltham, Mass.
For primary bibliographic entry see Field 01B.
W72-13842

INVESTIGATIONS OF ORGANIC MATTER IN GROUNDWATER OF OIL- AND GAS-BEARING REGIONS (METODICHESKIYE ISSLEDOVANIYA V OBLASTI IZUCHENIYA ORGANICHESKOGO VESHCHESTVA PODZEMNYKH VOD NEFTEGAZONOSNYKH OBLASTEY),
For primary bibliographic entry see Field 05B.
W72-13856

THE RIVER WEAR: INORGANIC CHEMISTRY RELEVANT TO A BIOLOGIST,
Durham Univ. (England).
M. Snow, and B. A. Whitton.
Vasculum, Vol. 56, No. 3, p 50-58, 1971. 3 fig, 1 tab, 17 ref.

Descriptors: *Baseline studies, *Water chemistry, *Water analysis, *Nutrients, *Surveys, Rivers, Water properties, Water quality, Nitrates, Nitrites, Silicates, Phosphates, Dissolved oxygen, Chlorides, Calcium, Magnesium, Zinc, Lead, Ammonia.
Identifiers: *River Wear, Inorganic ions, England.

The inorganic chemistry of the non-brackish reaches of the River Wear, Northeast England, is summarized, especially those ions important in plant growth, for comparison with other rivers. Analyses included magnesium, calcium, chloride, silicate, zinc, lead, ammonia, nitrate, nitrite and oxygen. From the biological point of view, the sharpest changes were the increase in nitrate and phosphate below Wadsworth sewage works, and an increase in hardness, especially that due to magnesium, below the River Gaunless. All nutrients increased in passing down the river, phosphate showing the largest increase and nitrate the second largest. (Svensson-Washington)
W72-13866

AMIDE-WATER INTERACTION ON MONTMORILLONITE SURFACE,
Ministry of Agriculture, Zagazig (Egypt). Soil Science Dept.
For primary bibliographic entry see Field 02G.
W72-13916

CARBONATE CHEMISTRY OF AQUIFER AND STREAM WATER IN KENTUCKY,
Kentucky Univ., Lexington. Dept. of Geology.
For primary bibliographic entry see Field 02F.
W72-14004

THE GENESIS OF SELECTED HYDROCHEMICAL FACIES IN BATON ROUGE, LOUISIANA, GROUND WATERS,
Louisiana State Univ., Baton Rouge. Dept. of Geology.
For primary bibliographic entry see Field 02F.
W72-14008

WEATHERING OF BASALTIC TEPHRA ON THE ISLAND OF HAWAII,
California Univ., Berkeley. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 02J.
W72-14014

BROWN AND GRAY SANDS ON THE VIRGINIA SHELF: COLOR AS A FUNCTION OF GRAIN SIZE,
Old Dominion Univ., Norfolk, Va. Inst. of Oceanography.
For primary bibliographic entry see Field 02J.
W72-14017

CHEMICAL FACTORS THAT INFLUENCE THE AVAILABILITY OF IRON AND MANGANESE IN AQUEOUS SYSTEMS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 05B.
W72-14022

THE ANALYSIS OF TRACE ORGANICS IN FRESH WATER BY GAS CHROMATOGRAPHY -- MASS SPECTROSCOPY,
New Hampshire Univ., Durham. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-14057

AN EXPERIMENTAL STUDY OF THE STRUCTURE, THERMODYNAMICS AND KINETIC BEHAVIOR OF WATER,
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 01B.
W72-14060

PROPERTIES OF SEAWATER AND ITS CONCENTRATES AND RELATED SOLUTIONS AT TEMPERATURES UP TO 400 DEGREES F,
California Univ., Berkeley.
For primary bibliographic entry see Field 01B.
W72-14062

OPTIMIZATION OF DISSOLVED OXYGEN MEASUREMENTS,
Envirogenics Co., El Monte, Calif.
For primary bibliographic entry see Field 05A.
W72-14066

A NEUTRON SCATTERING STUDY OF THE KINETICS OF DIFFUSION AND THE RELATION TO THE STRUCTURES OF IONIC SOLUTIONS,
Union Carbide Corp., Tuxedo, N.Y.
For primary bibliographic entry see Field 01B.
W72-14067

STATISTICAL STUDIES ON THE RELATION BETWEEN NITRIFICATION AND SOIL TEMPERATURE AND SOIL MOISTURE,
Deutscher Wetterdienst, Brunswick (West Germany).
For primary bibliographic entry see Field 02G.
W72-14200

2L. Estuaries

ESTURINE ECOSYSTEMS AND HIGH TEMPERATURES,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 05C.
W72-13636

SAMPLING AND SPATIAL DISTRIBUTION OF BENTHONIC FORAMINIFERA,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 05A.
W72-13674

FRESH WATER WINNING AND SALT WATER ENCROACHMENT IN THE AMSTERDAM DUNE WATER CATCHMENT AREA,
Amsterdam Water Works (Netherlands).
For primary bibliographic entry see Field 04B.
W72-13724

SALINITY TOLERANCES OF SOME COMMON PROSOBRANCHS,
Mount Allison Univ., Sackville (New Brunswick). Dept. of Biology.
For primary bibliographic entry see Field 05C.
W72-13795

A STUDY OF LIGHT ATTENUATION IN MONTEREY BAY, CALIFORNIA,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 05A.
W72-13798

ATLANTIC CONTINENTAL SHELF AND SLOPE OF THE UNITED STATES-PETROLOGY OF THE SAND FRACTION OF SEDIMENTS, NORTHERN NEW JERSEY TO SOUTHERN FLORIDA,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02J.
W72-13830

TIDAL VARIATION OF THE SUSPENDED SEDIMENT SIZE DISTRIBUTION AT A STATION IN UPPER CHESAPEAKE BAY,
Maryland Fish and Wildlife Administration, Annapolis.
J. R. Schubel.
Available from NTIS, Springfield, Va 22151 as COM-72-10386, for $3.00 paper copy; $0.95 microfiche. Chesapeake Bay Institute Technical Report 63 (Reference 70-2), Johns Hopkins University, February 1970. 28 p, 8 fig, 5 tab, 4 ref.

Descriptors: *Sediment transport, *Suspended solids, *Particle size, *Tidal effects, *Chesapeake Bay, Estuaries, Suspended load, Sampling, Data collections, Currents (Water), Tidal waters, Sediment distribution.
Identifiers: *Suspended sediment, *Sediment size analysis.

Sedimentation size analyses were determined on suspended sediment samples collected over a tidal cycle at three depths in 0.5 m of water in the upper Chesapeake Bay. At the surface, the volume-weighted mean Stokes' diameter ranged from 2.9 to 3.7 microns and the concentration of suspended sediment varied from 11.2 to 14.6 mg/liter. At 8 m the mean Stokes' diameter, the standard deviation, and the concentration of suspended sediment were progressively shifted to larger values with increasing current speed and back to their slack water values with waning tidal currents. The mean Stokes' diameter ranged from 2.9 to 11.7 microns, the standard deviation from 5.2 to 14.5 microns, and the concentration of suspended sediment from 13.8 to 93.0 mg/liter. At 9 m the same pattern was observed, but the variations were greater. The mean Stokes' diameter ranged from 3.3 microns during slack water to 22.9 microns at maximum current. The standard deviation ranged from 5.0 to 24.5 microns and the concentration of suspended sediment from 19.5 to 201.1 mg/liter. The suspended particle population is comprised of two subpopulations--those particles in more or less continual suspension throughout the water column, and those particles alternately suspended and deposited by the waxing and waning of the tidal currents. (See also W72-13847 and W72-13849) (Woodard-USGS)
W72-13837

HYDROLOGY OF ALABAMA AREAS--COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY,
Alabama Marine Resources Lab., Dauphin Island.
For primary bibliographic entry see Field 05B.
W72-13840

SEA WATER INTRUSION: MORRO BAY AREA, SAN LUIS OBISPO COUNTY,
California State Dept. of Water Resources, Sacramento.
G. Torres, Jr.
California Department of Water Resources Bulletin No 63-6, February 1972. 104 p, 15 fig, 13 tab, 30 ref, 7 append.

Descriptors: *Saline water intrusion, *Aquifers, *Groundwater movement, *Coasts, *California, Hydrogeology, Water wells, Pumping, Drawdown, Groundwater recharge, Water pollution sources, Salinity, Hydrologic data, Data collections, Water quality control, Water resources development, Watershed management, Water level fluctuations, Water table.
Identifiers: *Morro Bay area (Calif).

Investigations were made to determine the nature and extent of sea water intrusion and to define the hydrogeologic parameters related to the intrusion and to define the hydrogeologic parameters related to the intrusion in aquifers of the Morro Bay area, California. The geology, hydrology, and water quality of the area were reviewed; the status of sea-water intrusion was determined; and the potential for further intrusion was evaluated. Because the quality of groundwater has been degraded by the intrusion of sea water, several wells have been abandoned along the coastal margin of Morro, Chorro, and Los Osos Ground Water Basins in the Morro Bay area of San Luis Obispo County. Increases in chloride-ion content in groundwater have occurred primarily in response to the lowering of water levels to below sea level during periods of intensive pumpage. In localized areas, other probable sources of degradation are the natural intrusion resulting from a decline in recharge at dry periods, downward percolation of ocean water in tidal areas, and the dissolution of evaporites by downward percolating waters. (Woodard-USGS)
W72-13846

SUSPENDED SEDIMENT DATA SUMMARY MARCH 1966-MAY 1967, UPPER CHESAPEAKE BAY (TOLCHESTER TO HAVRE DE GRACE),
Maryland Fish and Wildlife Administration, Annapolis.
J. R. Schubel, C. H. Morrow, and W. B. Cronin.
Available from NTIS, Springfield, Va 22151 as COM-72-10388, for $3.00 paper copy; $0.95 microfiche. Chesapeake Bay Institute Special Report 14 (Reference 68-11), Johns Hopkins University, November 1968. 60 p, 1 fig, 2 tab, 2 ref.

Descriptors: *Sediment transport, *Suspended solids, *Chesapeake Bay, *Suspended load, *Basic data collections, Sampling, Depth, Weather, Wind velocity, Salinity, Light penetration, Secchi disks, Reviews, Estuaries.
Identifiers: Combustible organic matter.

Twenty-four surveys were carried out measuring suspended sediment in the upper Chesapeake Bay during the period March 1966 through May 1967. The data collected on these cruises are summarized. The tables of data for each sampling site include location, date, time, weather, wind direction, wind speed, depth of sampling, water temperature, salinity, suspended sediment, combustible organic matter, and light penetration. (See also W72-13837 and W72-13847) (Woodard-USGS)
W72-13849

TOPOGRAPHY AND RECENT SEDIMENTS OF THE LITTORAL ZONE OF SOVIET FAR EASTERN SEAS (OSOBENNOSTI FORMIROVANIYA REL'YEFA I SOVREMENNYKH OSADKOV PRIBREZHNOY ZONY DAL'-NEVOSTOCHNYKH MOREY SSSR).
For primary bibliographic entry see Field 02J.
W72-13860

APPARATUS FOR MEASURING PROPERTIES OF A FLUID BODY FROM AN AIRBORNE VEHICLE,
Buzzards Bay Corp., Marion, Mass. (Assignee).
For primary bibliographic entry see Field 07B.
W72-13876

MARIN ENVIRONMENTAL QUALITY, SUGGESTED RESEARCH PROGRAMS FOR UNDERSTANDING MAN'S EFFECT ON THE OCEANS.
National Academy of Sciences-National Research Council, Washington, D.C. Committee on Ocean Sciences.
For primary bibliographic entry see Field 05A.
W72-13903

THERMAL EFFLUENTS FROM ELECTRICAL POWER GENERATION,
Fisheries Research Board of Canada, West Vancouver British Columbia). Pacific Environment Inst.
For primary bibliographic entry see Field 05C.
W72-13905

A FRAMEWORK FOR IDENTIFICATION AND CONTROL OF RESOURCE DEGRADATION AND CONFLICT IN THE MULTIPLE USE OF THE COASTAL ZONE,
California Univ., Berkeley. Dept. of Landscape Architecture.
For primary bibliographic entry see Field 05G.
W72-13906

FISH AND WILDLIFE IN THE MARINE AND COASTAL ZONE, PART A, SUMMARY PLANNING INFORMATION, AND RECOMMENDATIONS,
California State Dept. of Fish and Game, Sacramento.
For primary bibliographic entry see Field 06G.
W72-13908

DDT RESIDUES IN EIGHT CALIFORNIA MARINE FISHES,
Philadelphia Community Coll., Pa.
For primary bibliographic entry see Field 05B.
W72-13946

WATER BANK PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Agricultural Stabilization and Conservation Service, Washington, D.C. Conservation and Land Use Programs.

For primary bibliographic entry see Field 06G.
W72-13959

ADSORPTION-DESORPTION EQUILIBRIA OF SOME RADIONUCLIDES IN SEDIMENT-FRESHWATER AND SEDIMENT-SEAWATER SYSTEMS,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco).
For primary bibliographic entry see Field 05B.
W72-13974

STUDIES ON THE BEHAVIOURS AND DISTRIBUTION OF RADIOACTIVE SUBSTANCES IN COASTAL AND ESTUARINE WATERS,
Japan Atomic Energy Research Inst., Osaka.
For primary bibliographic entry see Field 05B.
W72-13976

THE EVALUATION OF PUBLIC RADIATION EXPOSURE FROM THE CONTROLLED MARINE DISPOSAL OF RADIOACTIVE WASTE (WITH SPECIAL REFERENCE TO THE UNITED KINGDOM),
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 05B.
W72-13977

ANOMALOUS TH228/TH232 AND TH230/232 ACTIVITY RATIOS IN BACKWATER SEDIMENTS ALONG THE WEST COAST OF INDIA.
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
For primary bibliographic entry see Field 05B.
W72-13982

CHRONOLOGY OF A KETTLE-HOLE PEAT BOG, CHERRYFIELD, MAINE,
Wisconsin Univ., Madison. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 02J.
W72-14019

UNSTEADY FLOW OF GROUND WATER,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 02F.
W72-14053

MODEL STUDIES OF OUTFALL SYSTEMS FOR DESALINATION PLANTS (PART II - ESTUARY MODELS),
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 05B.
W72-14064

THE SPARTINA TIDAL MARSHES OF THE ST. LAWRENCE ESTUARY AND THEIR IMPORTANCE TO AQUATIC BIRDS,
Canadian Wildlife Service, Sainte-Foy (Quebec).
A. Reed, and G. Moisan.
Nat Can. 98 (5): 905-922. Illus. Map. 1971. French summary.
Identifiers: Aquatic life, Birds, Brant, Ducks, Eiders, Estuarine environment, Food, Gulls, Heron, Marshes, *Spartina-M, *St. Lawrence estuary, *Tidal marshes.

Described are the major Spartina marshes found along the south shore of the St. Lawrence Estuary, Quebec. Their past and present use and abuse by man is discussed. An estimated 32% of the original 7800 acres of marsh has been diked-off for agricultural purposes. The ecology of the marshes is also discussed, placing particular emphasis on the ways by which this ecosystem is utilized by aquatic birds. A large population of black ducks inhabits the Spartina marshes during the spring and summer where it finds almost all of its breeding needs. Breeding populations of common eiders, herring gulls, great black-backed gulls, great blue herons, black-crowned night herons and several species of shorebirds, as well as migrating populations of Canada geese. Atlantic brant and other aquatic birds rely on this habitat as a source of food. It is concluded that potentially the St. Lawrence Spartina marshes' combined ecological, recreational, educational, aesthetic and touristic values are of greater importance than the agricultural values for which they are presently being exploited.--Copyright 1972, Biological Abstracts, Inc.
W72-14128

THE USE OF AERIAL PHOTOS IN PEDOLOGICAL CARTOGRAPHY OF THE AREA OF TRANSITION BETWEEN THE TROPICAL FOREST AND SAVANNA IN THE CENTRAL IVORY COAST,
Ghent Rijksuniversiteit (Belgium). Laboratorium voor Fysiologische Scheikunde.
For primary bibliographic entry see Field 07B.
W72-14129

THE FISH FAUNA OF THE ESTUARINE AREA OF THE RHINE AND MEUSE RIVERS,
Delta Inst. of Hydrobiological Research, Yerseke (Netherlands).
For primary bibliographic entry see Field 05B.
W72-14153

THE INFLUENCE OF ZALA RIVER ON THE BACTERIOLOGICAL CONDITION IN KESZTHELY-BAY (LAKE BALATON),
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
For primary bibliographic entry see Field 05C.
W72-14154

THE HYDROLOGICAL CONDITIONS OF AMBARO BAY (NORTHWESTERN MADAGASCAR): CONTRIBUTION TO THE STUDY OF A TROPICAL EUTROPHIC BAY, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Nosy Be (Madagascar). Centre Oceanographique (ORSTOM) de Nosy-Be.
For primary bibliographic entry see Field 05C.
W72-14182

THE MAIN PHYSICO-CHEMICAL CHARACTERISTICS OF SOILS OF THE VERTISAL AND SODIUM-CONTAINING TYPE IN THE ROCHEFORT MARSH AT ST-LAURENT-DE-LA-PREE (MARITIME CHARENTE, FRANCE),
Institut National de la Recherche Agronomique, Clermont-Ferrand (France). Station d'Agronomie.
For primary bibliographic entry see Field 02G.
W72-14190

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

AN EXAMPLE OF ECONOMIC PLATING WASTE TREATMENT BY REVERSE OSMOSIS,
Ontario Research Foundation, Sheridan Park. Dept. of Physical Chemistry.
For primary bibliographic entry see Field 05D.
W72-13687

REVERSE OSMOSIS SYSTEM,
Secretary of Agriculture, Washington, D.C.
E. Lowe, and E. L. Durkee.
U. S. Patent No 3552,574, 4 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 882, No 1, p 176, January 5, 1971.

Descriptors: *Patents, *Reverse osmosis, *Desalination, *Water softening, *Demineralization, *Membranes, Equipment, Separation techniques.

A diffusion cell contains a flat membrane and a shallow cavity. It provides for a pump for feeding liquid under super atmospheric pressure through the inlet and into the cavity where the liquid is moved against the membrane. The liquid which passes through the membrane is withdrawn separately from the substances which remain behind the membrane. (Sinha-OEIS)
W72-13879

VACUUM DISTILLATION PROCESS AND APPARATUS WITH DIRECT AIR CONTACT CONDENSING FOR DESALINATION OF WATER,
Aerovac Corp., Philadelphia, Pa. (Assignee)
J. J. Creskoff.
U. S. Patent No 3,553,084, 4 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 882, No 1, p 293, January 5, 1971.

Descriptors: *Patents, *Desalination, *Distillation, *Condensation, *Aeration, Water supply, Vaporization, Potable water.

Heated water is converted into vapor and in a condensation chamber having a partial vacuum the vapor is converted into potable water. When the condensation chamber reaches a predetermined temperature, the vapor is condensed and aerated at the same time. (Sinha-OEIS)
W72-13882

ION EXCHANGE APPARATUS FOR TREATING LIQUIDS,
Maschinenfabrik Augsburg-Nuernberg A.G., Essen (West Germany).
G. Kunz.
U. S. Patent No 3,554,376, 6 p, 2 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 882, No 2, p 654, January 12, 1971.

Descriptors: *Patents, *Ion exchange, *Water softening, *Desalination, Sea water, Potable water, Water treatment, Separation techniques, Equipment, Demineralization.

An active column and combined regenerating and washing are interconnected by pipe systems which include counterpressure chambers. This allows spent ion exchange material to be recycled from the active column through the other columns and back to the active column with a balanced rate of flow. (Sinha-OEIS)
W72-13885

DESALINATION APPARATUS AND PROCESS OF MANUFACTURE USING IMPROVED, ACID GRAFTED NITROGENOUS MEMBRANES,
Du Pont de Nemours (E. I.) and Co., Wilmington, Del. (Assignee).
D. G. Pye.
U. S. Patent No 3,554,379, 7 p, 2 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 882, No 2, p 654, January 12, 1971.

Descriptors: *Patents, *Desalination, *Membranes, Permselective membranes, Reverse osmosis, *Polymers, Water supply, Separation techniques.
Identifiers: *Nitrogenous membranes.

This is a process concerned with the improvement of acid grafted, linear nitrogenous polymeric membranes for use in reverse osmosis separation techniques. The membranes are treated so as to convert acid groups into less hydrophilic groups thereby to reduce the swelling tendency of the membranes. (Sinha-OEIS)

W72-13886

PROCESS FOR TREATING WATER WITH A POLYHALIDE RESIN USING A SEMIPERMEABLE MEMBRANE BARRIER,
Dow Chemical Co., Midland, Mich. (Assignee).
For primary bibliographic entry see Field 05F.
W72-13887

PROCESS AND APPARATUS FOR OBTAINING FRESH WATER FROM SALINE WATER,
Linde A.G., Hollriegelskreuth (West Germany) (assignee).
R. Becker.
U. S. Patent No 3,557,863, 6 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 882, No 4, p 1469, January 26, 1971.

Descriptors: *Patents, *Desalination, Potable water, Seawater, Saline water, Freshwater, *Evaporation, *Condensation.

Saline water is introduced through a nozzle into a hot, high-pressure gaseous stream. The mixture is then led into an evaporation chamber where the vapor-gas mixture is withdrawn from the upper section and engine-expanded in one or more stages and finally fresh water is condensed out by cooling. Energy is produced as a byproduct by the expansion of the gas-vapor mixture without the use of heated metallic heat-exchange surfaces. (Sinha-OEIS)
W72-13892

DISTILLATION APPARATUS FOR DESALINISATION OF SALINE WATER TO RECOVER FRESH WATER AS CONDENSATE,
Auscoteng Ltd., Adelaide (Australia) (assignee).
N. L. Foley, and A. H. Cheney.
U. S. Patent No 3,558,436, 4 p, 4 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 882, No 4, p 1597-1598, January 26, 1971.

Descriptors: *Patents, *Desalination, Potable water, *Distillation, Separation techniques, Equipment, *Evaporation, *Condensation.

Evaporation takes place in an evaporator operating at ambient temperatures. The resulting vapor is condensed to form distilled water. Evaporation is effected in an atmosphere of reduced pressure sufficient to boil the water at or near ambient temperature. Pressure reduction can be achieved by pumps. Condensation takes place in the active zone and the condensate enters a falling conduit so that there is a constant flow. Air which is entrained in the water is drawn off from the active zone. (Sinha-OEIS)
W72-13897

WATER DESALTING PROCESS AND APPARATUS,
J. H. Anderson.
U. S. Patent No 3,558,439, 6 p, 14 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 882, No 4, p 1598, January 26, 1971.

Descriptors: *Patents, *Desalination, Sea water, Freshwater, *Deaeration, *Evaporation, *Condensation, Distillation, Equipment, Treatment, Heat exchange.

Fresh water is obtained by deaerating and evaporating a stream of warm sea water and condensing the vapor. Deaeration is effected by exhausting the space above the warm water stream to the atmosphere by means of an air compressor. The water is thus subjected to a reduced pressure at which dissolved air comes out of solution. Evaporation occurs by subjecting the warm water to a vacuum, the latent heat of vaporization is supplied by the warm water itself. The low pressure water vapor is condensed by passing it in heat exchange relationship with a stream of relatively cold seawater. (Sinha-OEIS)

W72-13898

REVIEW OF CALIFORNIA'S REGIONAL WATER SUPPLY SYSTEMS AND POSSIBLE APPLICATIONS OF DESALTING,
Oak Ridge National Lab., Tenn. Nuclear Desalination Information Center.
For primary bibliographic entry see Field 03B.
W72-13917

PROPOSED HYBRID PROTOTYPE DESALTING PLANT FOR BROWNSVILLE, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Office of Saline Water, Washington, D.C.

Available from the National Technical Information Service as PB-206 256-D, $3.00 in paper copy. January 28, 1972. 34 p, 3 fig, 6 tab, 1 map.

Descriptors: *Texas, *Desalination processes, *Environmental effects, *Water supply, State governments, Legislation, Federal government, Local governments, Desalination plants, Water resources development, Sea water, Turbines, Natural gas, Research and development, Thermal water, Thermal pollution, Saline water, Salinity, Salt tolerance, *Rio Grande River.
Identifiers: *Environmental impact statement, *Brownsville (Tex).

The proposed project involves the design, construction, operation, and maintenance of an 8 million gallons per day prototype sea water desalination plant in cooperation with the Rio Grande Valley Municipal Water Authority and the city of Brownsville, Texas. Sea water will be withdrawn from the Brownsville Ship channel for use in the distillation plant and saline effluent water will be discharged into San Martin Lake. Unavoidable adverse environmental effects include gas emissions from boilers and turbines, noise from the operating plant, elevation of water temperature, concentrating of solids in the waste water, slightly increased water salinity from effluents, and the presence of copper and nickel and possibly other heavy metals in the waste stream. The consumption of 1.133 x 10 to the 9th power cu ft/year of natural gas is an irreversible commitment. The proposed project will establish the feasibility of a single purpose distillation plant for producing low cost fresh water from sea water. As such, there is no alternative. Comments on the proposed action were solicited from appropriate local and regional agencies. (Waldron-Florida)
W72-13958

V.T.E. DESALTING PLANT, ST. CROIX, U.S. VIRGIN ISLANDS ANALYSIS OF OPERATIONAL DATA,
Desalting Systems and Services, Inc., Fort Lauderdale, Fla.
R. E. Bailie, and O. J. Morin.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, price $1.00. Office of Saline Water Research and Development Progress Report No. 778, July 1972, 107 p, 17 fig, 4 append. OSW Contract 14-30-2743.

Descriptors: *Desalination, *Distillation, *Evaporator, *Operating experience, *Operating costs, *Virgin Islands, Pilot plants, Pre-treatment (Water).
Identifiers: *Vertical tube evaporators, *St. Croix (VI).

The operating history of the 1.0 mgd VTE evaporator, on St. Croix, U.S. Virgin Islands is reviewed. Ability of the plant to operate and meet design requirements is discussed. Analysis of maintenance and operating problems is presented. Discussions on improvements to materials, maintenance and operating procedures, instrumentation and water pretreatment is included. (OSW abstract)

W72-14058

POTENTIALS FOR DESALTING WATER IN THE TULAROSA BASIN, NEW MEXICO - A CASE STUDY,
New Mexico State Univ., University Park. Water Resources Research Inst.
H. R. Stucky, and W. C. Arnwine.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.00. Office of Saline Water Research and Development Progress Report No. 776, August 1971, 46 p, 27 fig, 14 tab, 23 ref, 2 append. OSW Contract 14-01-001-1838.

Descriptors: *Cost analysis, Water utilization, Economic feasibility, *Desalination processes, Saline water, *New Mexico, *Potential water supply.
Identifiers: *Tularosa Basin (NM), *Saline groundwater.

Fresh surface and ground water supplies are limited in New Mexico and are now almost wholly allocated to specific uses. However, the State of New Mexico has large quantities of saline water, which until recently had not been considered a potentially usable resource. This study considered the potentials of desalting in the Tularosa Basin in South Central New Mexico where large bodies of saline water underlie the basin. Potential water supply was made, including cost of electrodialysis, reverse osmosis and vacuum freezing desalting processes. The study recommends desalting as a first possibility for supplementing the fresh water supply for the city of Alamogordo, Holloman Air Force Base, and White Sands National Monument. (OSW abstract)
W72-14059

AN EXPERIMENTAL STUDY OF THE STRUCTURE, THERMODYNAMICS AND KINETIC BEHAVIOR OF WATER,
Midwest Research Inst., Kansas City, Mo.
For primary bibliographic entry see Field 01B.
W72-14060

A TURBULENT FLOW THEORY OF ELECTRODIALYSIS,
Massachusetts Inst. of Tech., Cambridge, Mass.
R. F. Probstein, Ain A. Sonin, and Eitan Gur-Arie.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $0.50. Office of Saline Water Research and Development Progress Report No. 771, April 1972. 41 p, 3 fig, 18 ref. Grant No. 14-30-2749.

Descriptors: *Electrodialysis, *Desalination, *Desalination apparatus, *Laminar flow, *Turbulent flow.
Identifiers: *Parallel channel, *Transport equations, *Schmidt numbers, *Limiting current density.

A hydrodynamic theory is presented of desalination by electrodialysis in a parallel channel system with unobstructed fully developed turbulent flow. A set of turbulent transport equations is derived for the mean salt concentration and electric field. Estimates show both assumptions to lead to sensibly the same final results. From the equations and boundary conditions it is shown that there are five parameters which govern the system performance. Four are the same as for the corresponding laminar case, while the fifth measures the thickness of the concentration diffusion sublayer, the value of which is taken to be given by semi-empirical turbulent mass transfer results for high Schmidt numbers. The thickness of this diffusion layer is found to be the critical factor governing the salt removal rate. Comparison of the theory is made with the experimental results of Cowan and Brown on average limiting current density and the agreement is found to be satisfactory. (OSW abstract)
W72-14061

PROPERTIES OF SEAWATER AND ITS CONCENTRATES AND RELATED SOLUTIONS AT TEMPERATURES UP TO 400 DEGREES F,
California Univ., Berkeley.
For primary bibliographic entry see Field 01B.
W72-14062

EXPLORATORY STUDY OF BRINE DISPOSAL USING FLUID-BED EVAPORATION,
Allied Chemical Corp., Idaho Falls, Idaho.
For primary bibliographic entry see Field 05E.
W72-14063

MODEL STUDIES OF OUTFALL SYSTEMS FOR DESALINATION PLANTS (PART II - ESTUARY MODELS),
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 05B.
W72-14064

DIRECT CONTACT DESULFATION LABORATORY AND PILOT PLANT DEVELOPMENT STUDY FOR SOFTENING OF SEA WATER,
G. P. Gelblum.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.00. Office of Saline Water Research and Development Report No. 735, October 1971. 104 p, 14 fig, 14 tab, 25 ref, 3 append. OSW Contract 14-30-2724.

Descriptors: *Sea water, *Water softening, By-products, *Carbon dioxide, Pilot plants, *Desalination, Scaling.
Identifiers: *Desulfation, *Direct contact desulfation, Acids, *Barium bicarbonate, Decalcification, Hard scale, Alkaline scale.

This report presents a novel and potentially attractive method to soften sea water by use of barium carbonate as the raw chemical in a closed cycle. The direct contact desulfation (DCD) process eliminates the need for ion exchange resins, previously used, with soluble barium salts and, therefore, offers a more direct and simple process that has the added advantage of possible removal of both calcium and sulfate ions instead of only the latter. Therefore, any degree of total softening is possible from complete removal of calcium and sulfate to lesser percentages of one or both ions. This DCD process also has the potential advantage over other sea water softening processes of cost reduction through sale of by-products, such as elemental sulfur or sulfuric acid, and caustic soda that are produced during the barium regeneration cycle. This aspect was not actually investigated under this contract, since well understood chemical engineering methods are involved. The report is a synopsis of the process and summary of the laboratory and pilot plant development work during a 4 months period. An economic study is not included. (OSW abstract)
W72-14065

OPTIMIZATION OF DISSOLVED OXYGEN MEASUREMENTS,
Envirogenics Co., El Monte, Calif.
For primary bibliographic entry see Field 05A.
W72-14066

A NEUTRON SCATTERING STUDY OF THE KINETICS OF DIFFUSION AND THE RELATION TO THE STRUCTURES OF IONIC SOLUTIONS,
Union Carbide Corp., Tuxedo, N.Y.
For primary bibliographic entry see Field 01B.
W72-14067

PERFORMANCE CHARACTERISTICS OF ADVANCED EVAPORATOR TUBES FOR LONG-TUBE VERTICAL EVAPORATORS (AN ADDENDUM),
Oak Ridge National Lab. Nuclear Desalination Information Center.
L. G. Alexander, and H. W. Hoffman.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $2.75. Office of Saline Water Research and Development Progress Report No. 699, March 1971, 359 p. Contract 14-30-2535.

Descriptors: Boiling, *Dropwise condensation, *Condensation, *Evaporation, Wetting, Flow, Heat transfer, *Distillation processes, Evaporators, Experimental data, Foaming, Porous media.
Identifiers: Tubing (Metal), Doubly fluted tubes, Corrugated tubes, Porous-surfaced tubes, Foam evaporation.

This companion volume to OSW R and D No. 644, Performance Characteristics of Advanced Evaporator Tubes for Long-Tube Vertical Evaporators, (See W71-11871), collects the data obtained in studies on the performance of evaporator tubes of several surface configurations. For each tube, the physical description and experiment summary is followed by an extended listing of the data and a graphical display of the results. (OSW abstract)
W72-14068

REVERSE OSMOSIS MEMBRANE MODULE (SPIRAL-WOUND CONCEPT),
Gulf Energy and Environmental Systems, Inc., San Diego, Calif.
S. S. Kremen, and A. B. Reidinger.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.00. Office of Saline Water Research and Development Progress Report No. 676, April 1971. 83 p, 28 fig, 24 tab, 4 ref. OSW Contract 14-01-0001-1745.

Descriptors: *Desalination, *Reverse osmosis, *Membrane processes, Membranes.
Identifiers: Module performance, Membrane materials.

Development work is reported on membrane supports and product channel components used in spiral-wound membrane modules for reverse osmosis. Various test modules 3 feet wide with membrane areas of 28 sq feet and 50 sq feet were fabricated and tested. One purpose was to develop synthetic fabrics for membrane supports as an alternate for the earlier use of glass heads. Successful module performance was obtained with the use of layers of fabric to provide combined membrane support and product flow channels. Preferred materials were dacron and nylon fabrics which were impregnated as required. (OSW abstract)
W72-14069

FREEZING PROCESS STUDIES,
Syracuse Univ. Research Inst., N.Y.
Jean-Eric Bajolle, Ashok Naimpally, Henry L. Mason, John Missirlis, and Philip A. Rice.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, Price $0.50. Office of Saline Water Research and Development Progress Report No 658, June 1971. 43 p, 11 fig, 10 tab, 34 ref. Grant 14-30-2578.

Descriptors: *Desalination, *Freezing, Porous media, *Permeability, Mass transfer, Particle size.
Identifiers: *Butane, *Vacuum stripping, Isotropic porous media.

Two projects were completed: Vacuum Stripping of Butane in a Packed Column; and Particle Size Distribution Effects in Isotropic Porous Media. In the first of these, overall mass transfer coefficients for the vacuum stripping of butane in a column packed with 4 mm Berl Saddlers were measured at different flow rates and column pressures. The butane stripping process for pressures above the vapor pressure of water was found to be liquid phase controlled and the coefficients were found to be consistent with those predicted by existing correlations for liquid mass transfer coefficients in other systems. This confirmation of existing correlations should permit the design of vacuum stripping packed towers based on existing mass transfer data. In the second completed work, the size distribution of the particles making up the packed bed seemed to have no effect on the permeability beyond the plus or minus 10% expected experimental error if the Sauter mean diameter was used as the mean diameter in the Carman-Kozeny equation. Permeabilities were measured for binary mixtures of beads with size ratios of up to 8:1 and for binary mixtures of beads with a size ratio of 4:1 in various proportions. In addition, two new projects were started: a study of the vacuum spray flash chamber for removing dissolved butane, and the initiation of a study of direct contact vaporization heat transfer.
W72-14070

WATER TRANSPORT IN HYPERFILTRATION MEMBRANES,
Weizmann Inst. of Science, Rehovoth (Israel). Polymer Dept.
D. Vofsi, and O. Kedem.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402, Price $1.25. Office of Saline Water Research and Development Progress Report No 653, May 1971. 117 p. Contract 14-01-0001-961.

Descriptors: *Membranes, *Membrane processes, *Ion transport, *Separation techniques, Saline water, Osmosis, Reverse osmosis, *Desalination, Permselective membranes, Semipermeable membranes.
Identifiers: *Hyperfiltration, *Coupling phenomena, Polyelectrolytes, Polypeptide membranes, Water transport.

Three areas were investigated: (1) preparation of charged membranes; (2) hyperfiltration through porous charged membranes; and (3) the state and transport of water in some phosphate esters. In the first area, a number of films based on polyvinyl alcohol, crosslinked and modified to contain charged groups, crosslinked polyvinylamine, and modified cellulosics, containing charged groups, were studied. From these studies, it appears that effective polyelectrolyte films can be prepared on finely porous supports. In the second area, the rejections of mixed electrolyte solutions by charged membranes were calculated from a modified Teorell-Meyer-Sievers model taking into account the effect of Donnan equilibria and streaming potentials. As a practical example, the rejections in a mixture of copper chloride and hydrochloric acid filtered through a positive membrane were derived and found to be in reasonable agreement with the experimental results. In the third area, the structure of free water and bound water in a series of liquid organic phosphates, for use in ion-selective membranes, were investigated. The chemical shifts arising from NMR-proton spectroscopy in tributylphosphate (TBP)-H2O solutions, as a function of the mole fraction of the dissolved water, could be divided into three concentration ranges. Each of these ranges were interpreted in terms of specific phosphate-water species present. (OSW abstract)
W72-14072

INFLUENCE OF STRONGLY BOUND COUNTER-IONS ON PERMSELECTIVE MEMBRANES,
Negev Inst. for Arid Zone Research, Beersheva (Israel).
F. deKorosy, E. Zergerson, and M. Zevulum.
Available from the National Technical Information Service as PB-207 035, $6.00 in paper copy,

$0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 380, Dec. 1968, 61 p, 15 fig, 8 tab. Grant No 14-01-0001-766.

Descriptors: *Electrodialysis, *Ion exchange, *Membranes, *Permselective membranes, Separation techniques, *Desalination processes, Ion transport, Electrochemistry, Diffusion, Ions.
Identifiers: *Counter-Ions, *Membrane poisoning, *Membrane fouling, Co-Ions, Membrane electrical resistance.

Membranes were found to show two extremes of behaviour. One group of membranes, with sites more uniformly dispersed in the matrix, changed resistance less during poisoning but the sign of their permselectivity changed more easily. The other extreme group, membranes in which the active groups are closely crowded near each other in the spaces between the material of the matrix, increase their resistance by several orders of magnitude, but need poisoning ions of higher valency and size to change the sign of their permselectivity. Various membranes were examined with various counter-ions. Size and valency of the counter-ions varied. The counter-ions were introduced into the membranes mostly by diffusion or by direct current at room temperature but a few experiments were tried with the aid of alternating current or at elevated temperature. Some membranes - those to which we later assigned a closed, crowded structure, - often equilibrated very slowly by diffusion, sometimes so slowly that real equilibrium was not attained within three months. The slowness manifested itself in attaining a final resistance value and was due to very slow adjustment of swelling or deswelling and not to the adjustment of internal composition. (OSW abstract)
W72-14073

OPERATION OF REVERSE OSMOSIS PILOT PLANTS,
Aerojet-General Corp., El Monte, Calif.
C. G. DeHaven, M. A. Jarvis, and C. R. Wunderlich.
Available from the National Technical Information Service as PB-207 663, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 356, August 1968. 184 p, 6 append. Contract 14-01-0001-1268.

Descriptors: *Desalination, *Membranes, *Reverse osmosis, Sea water, *Pilot plants, Potable water, California.
Identifiers: *Cellulose acetate membranes, Flux decline, *Newport Beach, (Calif).

The purpose of the program was the scale-up of reverse osmosis from a laboratory process to an economical system for the production of potable water in large amounts. Three series of tests were conducted in two 18 inch cells at the Newport Beach, California seawater site. 'T-series' membranes (cellulose acetate membranes based on acetone as the polymer solvent) were utilized during the first tests. The highest 21-day flux (7.6 gfd) was obtained at 1500 psi operating pressure. The flux decline over the entire 90-day operating period of the 1500 psi test averaged about 1/20 gfd per day. During the second series of sea water tests, a new type of membrane usually referred to as the 'U-series' was tested. Formed from a blend of cellulose diacetate and triacetate and cast from a mixed solvent of acetone and dioxane, the U-series membranes were superior to the T-series both with respect to salt rejection and to resistance to compression. In the 18 inch cell these membranes produced potable water from seawater feed for 6 weeks at an average of 7.5 gfd. The third series of sea water tests was conducted to examine the feasibility of two-stage sea-water desalination. The longest continuous two-stage seawater desalination operation lasted for a period of 51 days. The product salt concentration during this period ranged from 230 ppm (on the 6th day) to 660 ppm (51st day). After 43 days of operation with an average flux of 7.1 gfd, the product was no longer in the potable water range (<500 ppm). (OSW abstract)
W72-14074

STUDY OF MEMBRANE-SOLUTION INTERFACES BY ELECTRO-CHEMICAL METHODS,
California Univ., Berkeley. Sea Water Conversion Lab.
K. S. Spiegler.
Available from the National Technical Information Service as PB-207 369, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 353, August 1968. 112 p, 36 tab, 62 ref. Grant No 14-01-0001-652.

Descriptors: *Electrodialysis, *Membranes, *Electrochemistry, *Desalination, *Interfaces, Reverse osmosis, Pressure, Electrodes, Mass transfer.
Identifiers: *Membrane-solution IINTERFACES, *Current-voltage curves, *Polarization, Limiting current plateaus, Laser interferometry, Microelectrodes.

This is the first stage of a fundamental experimental study of mass-transfer at membrane-solution interfaces; the practical purpose of this investigation is the characterization of efficient spacers and turbulence promoters. Polarization at anion-exchange membranes in a laboratory cell by a 4-electrode method, limiting current plateaus were not observed. Addition of polystyrene sulfonate brought the current-voltage curves much closer to the shape of the polarographic plateaus predicted by solution of the Nernst-Planck equations. Current-voltage curves suggested that membrane heterogeneity may play an important part in polarization. Heterogeneities show up as dispersions of dielectric constant and frequency in the radio-frequency range. Laser interferometry and a method for the interferometric observation of the membrane-solution interfaces at low Reynolds numbers was developed. The results formed the basis for the design of a pilot-size unit for detailed mapping of polarization on a single plant-size (1.5 X 1.5 foot) membrane. Studies of modified cellulose acetate membranes for reverse osmosis were initiated by studying potential differences across a tubular reverse osmosis membrane as a function of pressure and circulation rate. The electrode at the low-pressure side of the membrane was always found to be positive with respect to the high-pressure electrode; after correction for the concentration difference the streaming potentials were found to be 8-10 millivolt per 100 psi when dilute sodium chloride solutions were used as feed. The potential differences increase with increasing circulation rate. Flow rate is proportional to pressure. Microelectrodes for membrane surface mapping were prepared and tested, viz. hybrid platinized platinum-silver/silver chloride electrodes and micro pH electrodes made of antimony. Theoretical work on reverse osmosis (jointly with O. Kedem) resulted in prediction of salt rejection as a function of production rate by extension of the Staverman-Katchalsky-Kedem equations, and in a mechanistic interpretation of the 'reflection factor' which expresses the degree of semipermeability of a membrane for reverse osmosis. (OSW abstract)
W72-14075

STUDY OF POLY (METHACRYLATES) AND POLY (URETHANES) AS REVERSE OSMOSIS MEMBRANES. EFFECT OF WATER CLUSTERING ON TRANSPORT PROPERTIES,
Massachusetts Inst. of Tech., Cambridge.
W. Vieth, A. S. Douglas, and R. Bloch.
Available from the National Technical Information Service as PB-207 662, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 352, August 1968. 62 p, 17 fig, 12 tab, 23 ref. Contract 14-01-0001-624.

Descriptors: *Reverse osmosis, *Membranes, *Permeability, Semipermeable membranes, Water of hydration, Ion transport, Osmosis, Permselective membranes, Desalination.
Identifiers: *Water transport properties, *Water clustering, *Water flux, Salt rejection, Polymethacrylate membranes, Polyurethane membranes, Asymmetric membranes.

The synthesis and transport properties of non-crosslinked copolymers from hydroxyethyl methacrylate (HEMA) and ethyl methacrylate (EMA) and membranes from poly (urethanes) were investigated. The studies of HEMA/EMA copolymers have shown that it is possible to control the permeability of the film by varying the HEMA/EMA ratio. Water and salt flux were calculated from the results of osmosis experiments. The mobility of water varies by several orders of magnitude between a high-flux cellulose acetate membrane and a low-flux HEMA/EMA membrane. The more hydrophilic polymers have the higher water transport as well as the higher salt flux. Studies of the mechanism of formation of the dense skin on cellulose acetate in the Loeb procedure and its trial application with HEMA/EMA membranes resulted in a new hypothesis governing the choice of solvent for binary casting solutions to make assymetric membranes. It is hypothesized that the dense layer is only obtained if the polymer is dissolved in an exceedingly good solvent. Otherwise, use of a poorer solvent will lead to a solution where the polymer solubility limit is rapidly exceeded; i. e., coagulation starts before formation of the skin, resulting in a porous surface layer. The study of poly (urethanes) led to the development of moderate flux, moderate rejection membranes. The data obtained show that the water flux at constant applied pressure increases rapidly with decreasing brine concentration. In an effort to confirm these hypotheses concerning membrane structure, attempts have been made to characterize the membrane in ways other than those employing reverse osmosis testing. The most fruitful methods have been the establishment of water vapor sorption isotherms and water vapor sorption transients. Analyses of the data resulting from transient sorption studies have been important because they have demonstrated that reverse osmosis transport properties can be described quite satisfactorily by consideration of purely diffusive flows, without recourse to postulation of accompanying pore-flow modes of transport. Using the Zimm-Lundberg clustering function, it is possible to calculate the average size of water clusters within the membranes from the sorption isotherms, using a 95% relative humidity reference level for purposes of comparison. The cluster sizes for poly (urethanes) are quite high, reaching values of 5 to 6, indicating strong interaction between water and polymer. (OSW abstract)
W72-14076

DISPOSAL OF BRINE BY SOLAR EVAPORATION,
New Mexico State Univ., University Park.
For primary bibliographic entry see Field 02D.
W72-14077

DRYING CELLULOSE ACETATE REVERSE OSMOSIS MEMBRANES,
Gulf General Atomic Co., San Diego, Calif.
K. D. Vos, and F. O. Burris, Jr.
Available from the National Technical Information Service as PB-207 661, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 348, November 1967. 20 p, 8 tab, 1 fig, 14 ref. Contract 14-01-0001-767.

Descriptors: *Membranes, *Reverse osmosis, *Membrane processes, Pressure, *Desalination.
Identifiers: Dry reverse osmosis membranes, *Cellulose acetate membranes, *Surface active agents, *Plasticizers.

Cellulose acetate reverse osmosis membranes, after being soaked in a surface active agent, have been dried at either ambient or elevated temperatures (110C). Upon being rewet, the membranes did not show any loss in desalination or physical properties as compared with the undried control membrane. All types of surface active agents (nonionic, anionic, cationic, and amphoteric) will function well. Because the dry membranes are somewhat brittle, glycerin and ethylene glycol have been used as plasticizers for the dry membrane. (OSW abstract)
W72-14078

BIOLOGICAL DEGRADATION OF CELLULOSE ACETATE REVERSE OSMOSIS MEMBRANES,
Aerojet-General Corp., El Monte, Calif.
P. A. Cantor, B. J. Mechalas, O. S. Schaeffler, and P. H. Allen, III.
Available from the National Technical Information Service as PB-207 948, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 340, June 1968. 45 p, 16 fig, 4 tab, 10 ref. Contract 14-01-0001-1307.

Descriptors: *Membranes, *Reverse osmosis, *Biodegradation, Saline water, Microorganisms, Semipermeable membranes, Degradation (Decomposition), Desalination analytical techniques.
Identifiers: *Cellulose acetate, *Membrane sterilization, Biological stability, Water flux, Salt rejection.

An investigation was carried out with the objective of relating losses in semipermeability of cellulose acetate reverse osmosis membranes to microbiological degradation. Three sources of potentially destructive organisms were cultured and enriched using cellulose acetate and the sole source of carbon. One source of microorganisms was a set of failed cellulose acetate membranes taken from low pressure reverse osmosis units operated on industrial tap water. The other two sources were independent of reverse osmosis, being a surface soil sample and a lake bottom mud. Freshly prepared, sterilized membranes were exposed to 26 microbial isolates. Reverse osmosis testing of the membranes shaken in broth revealed significant losses in salt rejection of certain samples after 2 months, while visual observation of plated membranes showed complete degradation of certain of the samples from each of the three sources of microorganisms. Examination of membranes stored in a suspected source of degradative microorganisms by the MIR-infrared technique showed losses of up to 50% of the acetyl content in two months. Reverse osmosis testing of the membranes revealed no salt rejecting capability remaining. Cellulose triacetate membranes have been shown to be resistant to biological attack under conditions identical to those causing degradation of diacetate membranes having a degree of substitution of 2.3 to 2.5. (OSW abstract)
W72-14079

CONTROL OF CONCENTRATION POLARIZATION IN REVERSE OSMOSIS DESALINATION OF WATER,
Amicon Corp., Lexington, Mass.
H. Strathmann.
Available from the National Technical Information Service as PB-207 368, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 336, April 1968. 97 p, 10 tab, 27 fig, 14 ref. Contract 14-01-0001-964.

Descriptors: *Desalination, *Reverse osmosis, *Membrane processes, *Concentration polarization, *Laminar flow, *Turbulent flow.
Identifiers: *Thin channel flow cell, *Polyelectrolyte membrane, *Fotonic sensor, *Sodium chloride solutions.

The objective was to test experimentally predictions on concentration polarization provided by a theoretical analysis of P.L.T. Brian for laminar flow in thin channel systems. Concentration polarization data for sodium chloride solutions of various concentrations and cellulose acetate membranes were determined in a thin channel laminar flow cell at channel heights varying from 5 to 50 mils and with product water recovery rates from less than 1% to 80%. To simulate desalination with the high flux, highly retentive membranes which are likely to be developed in the near future, concentration polarization has been studied at a polyelectrolyte resin membrane with a water flux up to 80 gsfd at 100 psig effective pressure and tetrabutylammonium chloride solutions of various concentrations. For these investigations, a thin channel cell was constructed with a channel height variable between 2 and 20 mils. The channel height was controlled by a fotonic sensor system with an accuracy of plus or minus 5%. The experimental results obtained in different systems with product water fluxes between 1 and 80 gsfd and recovery rates of less than 1% to 80% have been critically compared with theoretically computed data. Good agreement between experimental and theoretical data has been established in nearly all cases and the advantages of a thin channel reverse osmosis desalination device, as predicted by P.L.T. Brian, have been demonstrated. (OSW abstract)
W72-14080

APPLICATION OF INORGANIC ION EXCHANGE MEMBRANES TO ELECTRODIALYSIS,
IIT Research Inst. Chicago, Ill.
K. S. Rajan.
Available from the National Technical Information Service as PB-207 660, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 328, April 1968. 100 p, 14 tab, 52 fig. Contract 14-01-0001-1099.

Descriptors: *Electrodialysis, *Ion exchange, *Membranes, *Desalination, Inorganic compounds, Demineralization, Electrochemistry, Anion exchange, Cation exchange.
Identifiers: Inorganic membrane electrodialysis, *Hydraulic flow rate, *Liquid flow pattern, Polarization, Zirconium phosphate, Thorium hydrous oxide.

Effects of some important parameters on the performance characteristics of inorganic membrane electrodialysis units were investigated. The variables included: (1) hydraulic liquid flow rate, (2) ratios of throughput rates of concentrating and diluting streams, and (3) liquid flow pattern. Zirconium acid phosphate and thorium hydrous oxide membranes were used as the cation- and anion-exchange membranes, respectively, in the multicompartment cells. The stabilities and performance characteristics of IITRI inorganic and a typical commercial organic membrane stacks were investigated in separate long-term (220 hr) electrodialysis experiments by employing current reversal technique. Both the units maintained steady performance at the preset values of 30 to 35% salt removal and 90 to 95% current efficiency. The effects of the presence of dodecylbenzene sulfonate and iron on the electrodialysis of chloride brines were investigated. Although the overall ohmic resistance of the inorganic membrane unit was somewhat larger than that of typical organic membrane units, the former showed steadier performance at the preset conditions of salt removal and hydraulic liquid flow. Basic properties such as ion-exchange capacity, moisture content, tensile and burst strengths, electrical resistance, transference numbers, salt leak coefficients and bi-ionic potentials were evaluated for the zirconium phosphate and the thorium hydrous oxide membranes. (OSW abstract)
W72-14081

HYDRAULIC DESIGN OPTIMIZATION OF THE ELECTRODIALYSIS PROCESS,
Process Research, Inc., Cambridge, Mass.
J. D. Smith.
Available from the National Technical Information Service as PB-207 659, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 325, (1968). 136 p, 42 fig, 14 tab, 33 ref. Contract 14-01-0001-963.

Descriptors: *Desalination, *Electrodialysis, *Design, *Operating costs.
Identifiers: *Electrodialysis spacers, Limiting current density, Membrane resistance.

The objectives were to expand the conventional electrodialysis design expressions and use the improved expressions to determine the research and development areas having the greatest potential for process improvement. After the development of a mathematical expression which encompassed the various important parameters, an experimental program was developed to permit the formulation of the hydraulic performances of electrodialysis spacers and to develop functional relationships between the limiting current density and the geometry of electrodialysis spacers. Finally, the analytical phase of the work was concerned with the effects on the optimal electrodialysis design and minimum cost of changes in the various operational, technological and economic parameters. The following conclusions were drawn: (1) Electrodialysis spacers, under almost any circumstances, should be thinner than those presently used (approx. 0.1 cm). (2) Within the present economic structure of the electrodialysis process, improved spacer design would result in the greatest immediate cost reduction. (3) After the improvement of spacer design, reduction in the unit costs of membranes, or in costs proportional to membrane area, would offer the most significant cost reduction. (4) The third significant cost reduction possibility would be reduced D. C. energy costs. (5) A reduction in membrane resistance would result in a corresponding reduction in the minimum cost. (OSW abstract)
W72-14082

TRANSPORT PROCESSES IN HYPERFILTRATION MEMBRANES I,
Weizmann Inst. of Science, Rehovoth (Israel). Polymer Dept.
D. Vofsi, and O. Kedem.
Available from the National Technical Information Service as PB-207 947, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 324, May 1968. 41 p, 17 fig, 6 tab, 6 ref. Contract 14-01-0001-961.

Descriptors: *Membranes, *Ion transport, *Reverse osmosis, Porosity, *Desalination.
Identifiers: *Hyperfiltration, *Charged membranes, *Polyelectrolytes, *Negative salt rejection, Cellulose acetate membranes, Model membranes, Reflection coefficient, Counter-Ion, Co-Ion, Mosaic membranes.

Research on hyperfiltration is reported in three separate parts. Part I is concerned with theoretical studies of hyperfiltration in charged membranes and negative salt rejection in mosaic membranes. Salt rejection, R, in charged membranes was evaluated according to the fixed charge model as described by Teorell-Meyer-Sievers. The limiting salt rejection at high flow rates, R, is given by the reflection coefficient corresponding to the salt

concentration in the feed solution: R = σ'. Concentration profiles at high flow rates confirm this conclusion. The reflection coefficient, σ', is completely determined by the ratio between membrane charge and feed concentration, the valencies of the ions and the transport number of the counter-ion in free solution. R was calculated for a wide region of relative charge densities, and several transport numbers corresponding to some common electrolytes. High transport number of the co-ion decreases R. The divalent counter-ions salt rejection is lower, as a consequence of the different ion distribution. Negative values for R are obtained in a considerable part of the region. High salt rejection is obtained for divalent co-ions. Part II involves preparation and testing of loose, charged membranes. The results of these experimental measurements show that it is possible to obtain synthetic polyelectrolyte membrane with rather high flux and considerable salt rejection. In Part III studies were made of the porosity of the skin and support in asymmetric cellulose acetate membranes. From the data obtained, calculations of the skin thickness gave a value of 1000 - 2000A. (OSW abstract)
W72-14083

RESEARCH ON ION TRANSPORT ACROSS MICROBIAL MEMBRANES,
TRW Systems Group, Redondo Beach, Calif.
N. L. Gale, and B. H. Goldner.
Available from the National Technical Information Service as PB-207 658, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 323, April 1968. 50 p, 13 tab, 9 fig, 16 ref. Contract 14-01-0001-636.

Descriptors: *Ion transport, *Membranes, *Biological membranes, Ion exchange, Ions, Microorganisms, Cation exchange, Bacteria, *Desalination.
Identifiers: *Cell membranes, *Active transport, *Microbial membranes, Cells, Light scattering, Sodium transport, Potassium transport.

Comparisons of growth characteristics, cation content, and rate of cation transport have been made under a variety of conditions with the two microorganisms, Serratia marcescens and S. marinoruba. The transport of cations was determined by observing the changes in the amount of light scattered by resting cell suspensions in which the ionic strength of the external solution was adjusted so as to be hypertonic to the interior of the cell. With the proper physical environment and in the presence of compounds capable of being transported into the cells, deplasmolysis and the resultant decrease in scattered light were observed. This approach was supplemented by the quantitative determination of selected intracellular cations by atomic absorption spectrometry in cells prior to and following the addition of hypertonic and hypotonic salt solutions. It was found that the choice of growth medium and the method of washing and preparing the resting cells played important roles in determining the amount of intracellular salts remaining within the cells, and consequently in the cells' behavior as observed by the light scattering technique. Both microorganisms tend to accumulate K+ during growth and to exclude Na+ against concentration gradients. The amount of K+ accumulated within the cells is increased, particularly in S. marinorubra, as the ionic strength is raised in the medium in which the organisms are grown. (OSW abstract)
W72-14084

CONTINUING DEVELOPMENT OF A GENERAL MECHANISTIC THEORY OF MEMBRANE PHENOMENA AND CONTINUING EXPERIMENTAL AND THEORETICAL STUDIES OF ION-EXCHANGE POLARIZATION PHENOMENA,
Polytechnic Inst. of Brooklyn, N.Y.
H. P. Gregor.
Available from the National Technical Information Service as PB-207 657, $3.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 322, April 1968. 164 p, 44 tab, 30 fig, 41 ref. Contract 14-01-0001-757.

Descriptors: *Ion exchange, *Membranes, *Electrodialysis, Diffusion, *Desalination.
Identifiers: *Polarization, *Transport phenomena, *Ion exchange membranes, Selectivity coefficients, Transport number, Anion exchange membranes, Cation exchange membranes, Sandwich membranes.

This report is made up of five sections, each with its own table of contents and bibliography. These are: (I) Transport Processes in Ion-Exchange Membranes; (II) Polarization Phenomena in Ion-Exchange Membranes; (III) Acid and Base Production by Electrodialysis Across Bipolar Ion-Exchange Membranes - Utilization for Prevention of Pollution; (IV) Selectivity Coefficients of Aliphatic Polyethyleneimine-Epichlorohydrin Anion-Exchange Resins Toward Univalent Anions; and (V) Ion-Exchange Membranes - Correlation Between Structure and Function. (OSW abstract)
W72-14085

A STUDY OF THE DISPOSAL OF THE EFFLUENT FROM A LARGE DESALINATION PLANT,
Dow Chemical Co., Midland, Mich.
For primary bibliographic entry see Field 05B.
W72-14086

REVERSE OSMOSIS MEMBRANE MODULE (SPIRAL WOUND CONCEPT),
Gulf General Atomic Co., San Diego, Calif.
T. L. Larson, S. S. Kremen, L. Nusbaum, and A. B. Riedinger.
Available from the National Technical Information Service as PB-207 946, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 313, August 1968. 68 p, 18 fig, 16 tab, 2 ref. Contract 14-01-0001-1245.

Descriptors: *Desalination, *Reverse osmosis, Pre-treatment (Water), Storage.
Identifiers: *Spiral wound module, Cleaning, Sterilization.

The program covered the areas of module development, pre-treatment and module cleaning, sterilization and storage, and parametric studies. A melamine-reinforced Dacron tricot backing material was developed which appears to be superior toglass beads up to 1000 psi. An adhesive was developed which eliminates the problems of water sorption, high pH, etc. which were characteristic of the adhesive used previously. Early problems with weak reinforcing strips were overcome by using Kapton or polypropylene films attached to the product water side of the membrane at the fold with a water-impervious pressure-sensitive adhesive. The polypropylene film has been tested in modules for more than 2000 hours at pressures up to 1000 psi with satisfactory performance. Various means of minimizing fouling, involving iron, magnesium, carbonate, sulfate and organic materials were evaluated in addition to cleaning and flushing procedures. It was found that reduction of the pH to the range 5 to 6 markedly reduced iron oxidation and precipitation for the San Diego tap water tested. Cyanamer P35 appeared to be the best precipitation inhibitor tested for calcium sulfate. The sterilization of feed water with dosages as low as 10 mg/l of chlorine in the feed water resulted in product water with no coliform organisms and a zero plate count on incubation in standard media. Testing indicated that microbial growth was controlled by storage of modules in a 1000 ppm CuSO4 solution. (OSW abstract)
W72-14087

TRANSPORT PROPERTY REQUIREMENTS OF MEMBRANES FOR USE IN PRESSURE DIALYSIS DESALINATION,
Office of Saline Water, Washington, D.C.
H. E. Podall.
Available from the National Technical Information Service as PB-207 945, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 304, June 1968. 41 p, 7 fig, 7 tab, 8 ref.

Descriptors: *Membranes, *Dialysis, *Pressure, *Ion transport, *Demineralization, Ion transport, Permeability, *Desalination, Osmosis.
Identifiers: *Pressure dialysis, *Phenomenological coefficients, *Water recovery, Hydraulic permeability, Flux, Negative osmosis, Solute permeability.

The transport property requirements of membranes for use in the novel 'pressure dialysis' process are defined in terms of the phenomenological coefficients, Lp, w' and σ derived by application of irreversible thermodynamics to this process. The phenomenological coefficients are, in turn, quantitatively related to various process and performance parameters and are enumerated for selected brackish or saline polluted concentrations where this process is considered best applicable. (OSW abstract)
W72-14088

3B. Water Yield Improvement

TECHNIQUES OF STATISTICAL EVALUATION OF RUNOFF RESULTS OF PRECIPITATION MODIFICATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-13841

PROBLEMS IN THE HEAT AND WATER REGIME OF AGRICULTURAL LANDS (VOPROSY TEPLOVOGO I VODNOGO REZHIMA SEL'SKOKHOZYAYSTVENNYKH POLEY).
For primary bibliographic entry see Field 03F.
W72-13858

METHOD FOR PREVENTING WATER LOSS FROM RESERVOIRS AND CHANNELS,
Witco Chemical Corp., New York. (Assignee).
For primary bibliographic entry see Field 04A.
W72-13889

TEST OF RUNOFF INCREASE DUE TO PRECIPITATION MANAGEMENT FOR THE COLORADO RIVER BASIN PILOT PROJECT,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel-Seytoux, and F. Saheli.
Completion Report, December 1971, 43 p. 11 tab, 20 ref.

Descriptors: *Statistical methods, *Testing, *Runoff, *Water harvesting, *Precipitation (Atmospheric), Water management (Applied), Hydrologic properties, Weight, Constraints, Stations, Control, Methodology, Colorado, Rainfall-runoff relationships, Water yield improvement.
Identifiers: *Colorado River Basin Pilot Project.

Classical problems exist in determining the effect of precipitation increment studies on runoff increase. A new test for detection of hydrologic change due to precipitation management is developed and compared to classical tests. The test is a target-control conditional Student's t-test applied to a new test variable. The variable is a linear combination of runoff variables with unknown weights. A proper choice of weights, compatible with hydrologic constraints, maximized the

power of the test. The power of the test is increased by a factor of two when applied to the Colorado River Basin Pilot Project as expressed in years needed for detection. Chance of detecting precipitation increase in runoff is better than one in two if precipitation increase is 10% on the average for this region over a 5-year period, or 17 in 20 at precipitation increase of 15%. The value of grouping runoff stations in the target and control areas is shown from a theoretical point of view. The new technique yields a power of classical tests from a practical point of view. (Popkin-Arizona)
W72-13912

REVIEW OF CALIFORNIA'S REGIONAL WATER SUPPLY SYSTEMS AND POSSIBLE APPLICATIONS OF DESALTING,
Oak Ridge National Lab., Tenn. Nuclear Desalination Information Center.
W. E. Thompson.
June 1972, 98 p. 56 fig, 16 tab, 30 ref. AEC Contract W-7405-eng-26.

Descriptors: *Water supply, *Desalination, *Application methods, *Water storage, *California, Water conveyance, Construction, Aqueducts, Colorado River Aqueduct, Reservoirs, Central Valley Project, Irrigation, Water rates, Costs, Water requirements, Water distribution (Applied), Sea water, Economics, Brines, Geothermal studies, Salinity, Colorado River.
Identifiers: All-American Canal, Sierra Nevada, California State Water Project, Imperial Valley, Gulf of California.

Development of water storage and conveyance facilities in California started with construction of major aqueducts in the early 1900's. Aqueduct systems currently supply half the water used. The Colorado River supplies 4 billion gallons per day (Bgd) by the All-American Canal and 1 Bgd through the Colorado River Aqueduct. Aqueducts from Sierra Nevada reservoirs supply 430,300 and 325 Mgd to various areas. The Bureau of Reclamation's Central Valley Project supplies 4,700 Mgd and will ultimately supply 9,500 Mgd for irrigation. Irrigation water rates range from 1 to 2 cents per 1000 gal. The 1973-completed California State Water Project will be capable of delivering 3,800 Mgd. It will meet southern California's water requirements through 1990 with rates of 14 to 25 cents per 1000 gal. for untreated water. The State Water Project will deliver water to central California at rates of 4 to 10 cents per 1000 gal. Sea water desalting may be economically competitive by 1990 on the southern California coast. Desalting of geothermal brines in the Imperial Valley or of sea water from the Gulf of California may be attractive for overcoming salinity problems of the Colorado River and for providing additional water. (Popkin-Arizona)
W72-13917

DECLARING WAR....ON MESQUITE,
Texas Agricultural EXTENSION Service, College Station.
G. O. Hoffman, and B. J. Ragsdale.
The Ranch Magazine, Vol 51, No 7, April 1971, p 13, 18, 25. 1 fig, 1 ref.

Descriptors: Brush control, *Weed control, *Water conservation, *Herbicides, *Mechanical control, *Chemcontrol, Mesquite, Soil moisture, Nutrients, Phreatophytes, Forages, Cattle, Range grasses, Weeds, Texas, Chemicals.

Mesquite invading areas of grass-bare soil, robs 56 million acres of Texas rangelands of precious moisture and plant nutrients. More forage for livestock can be produced when mesquite is controlled chemically and mechanically. In order to kill mesquite, which uses four times more water to produce a pound of plant than native grasses use to produce a pound of nutritious forage, the bark on its root crown must be eliminated. Resistant weeds which replace mesquite must be controlled. Mechanical mesquite control includes hand grubbing, rolling choppers, root cutters, anchor chains, bulldozers, shredders, tree or stinger dozers, and root plows. Chemical control includes Kerosene, diesel oil and herbicides. These methods are outlined. (Popkin-Arizona)
W72-13925

DEVELOPMENT OF FOREST MANAGEMENT PRACTICES FOR INCREASING SNOWPACK WATER YIELD,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 02C.
W72-13995

USE OF FOREST ATTRIBUTES IN SNOWPACK INVENTORY - PREDICTION RELATIONSHIPS FOR ARIZONA PONDEROSA PINE,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 02C.
W72-13996

3C. Use of Water of Impaired Quality

SULFURIC ACID: ITS POTENTIAL FOR IMPROVING IRRIGATION WATER QUALITY,
Arizona Univ., Tucson. Dept. of Agricultural Chemistry and Soils.
For primary bibliographic entry see Field 05G.
W72-13920

SOIL WATER REGIME IN ECONOMIC EVALUATION OF SALINITY IN IRRIGATION,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
E. Bresler, and D. Yaron.
Water Resources Research, Vol 8, No 4, p 791-800, August 1972. 2 fig, 1 tab, 10 ref.

Descriptors: *Soil water, *Irrigation, *Salinity, *Irrigation efficiency, *Irrigation water, Water quality, Water quantity, Irrigation practices, Economics, Evaluation, Estimating, Computer models, Statistical models, Optimization, Systems analysis.
Identifiers: Soil water suction.

In regions with a Mediterranean climate and a semiannual alternation of rainy and irrigation seasons, it seems more efficient to control salinity by regulating the soil water regime, as an alternative to control by leaching. The soil can be leached during the rainy season by rain and/or irrigation and the total water suction can be controlled during the crop-growing irrigation season by altering the water regime. Presented is an approach for the short-run determination of the economically optimal quantity-quality combination of the irrigation water during the irrigation season, when the soil water regime and the soil salt status are changed simultaneously. A field irrigation, water requirement experiment and computer and statistical models are used to estimate the functional relationships between the total water suction and the man-controlled variables: quantity and quality of irrigation water and frequency of irrigation. Data from the irrigation experiment show that situations exist in which increasing the quantity of irrigation water, shortening the time interval between irrigations, and increasing the depth of wetting lead to increasing salt concentration in the soil solution while at the same time decreasing the total and average soil water suctions. (Bell-Cornell)
W72-13932

ORIGIN OF SALINE SOILS AND THEIR REGIME, VOLUME 2,
Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.
V. A. Kovda.
Available from the National Technical Information Service as TT-70-50170, $3.00 in paper copy, $0l.95 in microfiche. US Dept of Agriculture, by Israel Program for Scientific Translations, Jerusalem, 1971. 311 p. (*Translation of Proiskhozhdenis i rezhim zasolennykh pochv, Izdatel'stvo Akademii Nauk SSR, Moskva-Leningrad, 1947).

Descriptors: *Saline soils, *Salinity, *Salt balance, *Salt tolerance, *Land reclamation, Farm management, Irrigation, Drainage, Plant growth, Plant morphology, Plant physiology, Fertilization, Seed treatment, Water balance, Groundwater, Valleys, Deltas, Terraces (Geologic), Grasslands, Deserts.
Identifiers: *USSR, *Oases, *Oasis agriculture, *Alluvial plains, *Subaerial, Topdressing.

This monograph is concerned with the classification of irrigated oases in the USSR, the effects of salinity on plants, and the measures employed to control salinity of soils under irrigation. Depending on age, geological structure, and geomorphology of the region, irrigated oases are divided into two principal groups: (1) oases on alluvial plains, comprising a system of level terraces of different age; and (2) oases in river deltas. Irrigated oases on alluvial plains may occur in fairly narrow intermountain valleys, such as Fergana, Zeravshan, Araks, or Vakhsh, or on extensive plains adjoining ancient plateaus or mountain divides, such as the left bank area of the Volga, or the area along the Dnieper. Oases in river deltas are classified as oases in marine deltas adjoining present-day seas and as oases in dry, continental subaerial deltas. (Josefson-USGS)
W72-14041

EMERGENCE, EARLY GROWTH, AND SALINITY OF FIVE VEGETABLE CROPS GERMINATED BY SPRINKLE AND TRICKLE IRRIGATION IN AN ARID ZONE,
Hebrew Univ., Jerusalem (Israel). Dept. of Irrigation.
For primary bibliographic entry see Field 03F.
W72-14106

EFFECT OF SALINE WATERS ON THE GERMINATION OF WATERMELON (CITRULLUS VULGARIS SCHRAD. EX ECKL. ET ZEYH.),
Rajasthan Univ., Jaipur (India). Agricultural Chemistry Section.
U. S. Pokharna, K. Mirchandani, and S. P. Seth.
Indian J Agric Sci. 41 (3): 210-215. 1971.
Identifiers: Alkali, Citrullus-Vulgaris-D, *Germination, *Saline water, Salts, Tolerance, *Watermelon-D.

Ten cultivars of C. vulgaris, viz. 'Sugerbaby,' 'Improved Kleckly Sweet,' 'Meetha,' 'Durgapura Keshar,' 'Cream,' 'Congo,' 'Charleston Gray,' 'New Hampshire,' 'Durgapura Basanti' and 'Ashaiyamato,' were studied for their tolerance to salt and alkali at the germination stage. These were treated with 35 types of waters of different electrical conductivity (EC) and Na-adsorption ratio (SAR) under laboratory conditions. The effects of these waters on germination varied with cultivar. 'Cream' and 'Sugarbaby' showed the maximum salt tolerance, followed by 'Durgapura Keshar' and 'Congo' whereas the others had medium salt tolerance. 'Cream' and 'Ashaiyamato' were the best alkali-tolerant cultivars.--Copyright 1972, Biological Abstracts, Inc.
W72-14126

3D. Conservation in Domestic and Municipal Use

WATER QUALITY OF STREAMS IN THE NESHAMINY CREEK BASIN, PENNSYLVANIA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02K.
W72-13737

THE RIVER BASIN MODEL: THE SOCIAL SCIENCE LABORATORY.
Environmetrics, Inc., Washington, D. C.
For primary bibliographic entry see Field 06A.
W72-13929

PROCEDURES FOR ESTIMATING THE HYDROLOGIC IMPACT OF URBANIZATION,
Regional Science Research Inst., Philadelphia, Pa.
For primary bibliographic entry see Field 04C.
W72-14002

USE OF WATER IN ARKANSAS, 1970,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 06D.
W72-14028

3E. Conservation in Industry

ENVIRONMENTAL GEOLOGY AND HYDROLOGY, TALLAHASSEE AREA, FLORIDA.
Florida Dept. of Natural Resources, Tallahassee. Bureau of Geology.
For primary bibliographic entry see Field 06D.
W72-13740

PROGRAM STATEMENT FOR THE PROPOSED PROTOTYPE OIL SHALE LEASING PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of the Interior, Washington, D.C.

Available from the National Technical Information Service as PB-200 436-D, $6.00 in paper copy. June 1971. 599 p, 44 fig, 10 map, 8 photo, 17 tab, ref, append.

Descriptors: *Rocky Mountain Region, *Environmental effects, *Oil shales, *Leases, Natural resources, Oil industry, Water pollution sources, Exploitation, Energy conversion, Federal government, Federal jurisdiction, Legal aspects, Energy.
Identifiers: *Environmental impact statement.

The growing pace of domestic fuel consumption has made the development and location of new sources of energy supply of paramount concern. Oil shale is a major undeveloped energy resource and rich deposits are located in the Rocky Mountains. The Department of Interior's program for prototype oil shale leasing in public lands is outlined. A total of 30,720 acres of land is possibly involved. The proposed program will include continuous assessment of the environmental consequences of oil shale development. A pre-implementation base will first be established from which to measure periodic assessment. Environmental studies on a regional level were initiated in 1970 by the Department of Interior in conjunction with state governors. Guidelines of these studies are listed and discussed. Detailed environmental studies will be made of each site selected for leasing. These studies will include sample core drilling; assessment of aquatic, plant, and animal resources; assessment of scenic resources; and analysis of mine wastes to be produced. Unacceptable sites will be eliminated. Following leasing the actual impact will be compared with the projected impact. Failure to meet projected environmental impacts may result in lease cancellation. (Grant-Florida)
W72-13969

USE OF WATER IN ARKANSAS, 1970,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 06D.
W72-14028

3F. Conservation in Agriculture

SPRINKLER IRRIGATION SYSTEM SOLVES WASTE WATER PROBLEMS.
For primary bibliographic entry see Field 05D.
W72-13691

PROCEEDINGS OF THE LAND SPREADING CONFERENCE AT ORLANDO, FLORIDA ON JULY 15, 1971.
East Central Florida Regional Planning Council, Winter Park.
For primary bibliographic entry see Field 05D.
W72-13704

SOIL SUITABILITY FOR SPRAY IRRIGATION,
Soil Conservation Service, Cocoa,Beach, Fla.
For primary bibliographic entry see Field 05D.
W72-13706

PLANTS AND WASTEWATER RENOVATION,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 05D.
W72-13707

SKELETON WEED (CHONDRILLA JUNCEA) IN THE VICTORIAN MALLEE: V. CHEMICAL FALLOWING,
Victorian Wheat Research Inst., Horsham (Australia).
G. J. Wells.
Aust J Esp Agr Anim Husb. Vol 11, No 50, p 320-327, 1971. Illus.
Identifiers: *Crop production, Aminotrizzole, Australia, Chondrilla juncea D, *Fallowing, Fenac, *Herbicides, Mallee, Moisture, Nitrates, Picloram, Simazine, Soils, Weed D, Wheat M.

Skeleton weed is difficult to control on cultivated fallows during the summer and experiments were commenced in 1963 on the use of short-term residual herbicides for chemically fallowing infested land for wheatgrowing. Rates and times of application of simazine mixtures, a picloram/2,4-D mixture, an atrazine/amitrole mixture, and fenac were tested. Compared with cultivated fallows, chemical fallowing increased wheat yields in 4 years out of 6. The yield responses were associated with increased soil nitrate and soil moisture at sowing, reflecting the improved weed control by herbicides, particularly during the summer period. The effects of toxic residues from simazine and atrazine on the wheat crop were influenced by rate and time of application, rainfall during the fallow period, and soil type.--Copyright 1972, Biological Abstracts, Inc.
W72-13708

ENGINEERING DESIGN CRITERIA FOR SPRAY IRRIGATION,
Bishop (William), Talahassee, Fla.
For primary bibliographic entry see Field 05D.
W72-13709

ACTUAL SPRAY FIELD OPERATIONS,
For primary bibliographic entry see Field 05D.
W72-13710

WASTEWATER RENOVATION AT TALLAHASSEE - EXPERIMENTAL STUDIES,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05D.
W72-13711

SOME ASPECTS OF EFFLUENT LAND-SPREADING,
Dawkins and Associates, Inc., Orlando, Fla.
For primary bibliographic entry see Field 05D.
W72-13712

AN ANALYSIS OF THE RAINFALL VARIATIONS IN COUNTY LEITRIM AND THEIR INFLUENCE ON AGRICULTURAL PRODUCTION,
Foras Taluntais, Drumboylan (Ireland).
J. Mulqueen.
Ir J Agric Res. Vol 10, No 2, p 223-238. 1971. Illus.
Identifiers: *Rainfall, *Crop production, Agriculture, Growth, Herbage, Ireland, Live..ock, Moisture, Soils, Variation.

The areal and seasonal distribution of rainfall in County Leitrim during 1931-60 was analyzed and frequency analyses were carried out on the amount of rainfall and the number of raindays during 1947-67 at Ballinamore. The mean annual rainfall was above the national average in over 2/3 of the county and was highest in the mountainous areas. April, May and June were the driest months of the growing season. There was a wide range in the amount of rainfall and in the number of raindays for any given month at Ballinamore. Potential evapotranspiration for any given month was fairly uniform from year to year. It was shown that high rainfall during the growing season results in a high soil moisture content in soils with impeded drainage. Wet growing seasons result in increased poaching, reduced machine efficiency, reduced herbage growth on grassland and increased management problems with livestock. Because of the high frequency of raindays (rainfall > or = 0.2 mm/day) during the haymaking season, it is difficult to make good quality hay at Ballinamore. A wide range in the rainfall amount and in the number of raindays makes farming more difficult to plan on soils with impeded drainage unless effective drainage is provided.--Copyright 1972, Biological Abstracts, Inc.
W72-13713

THE USE OF GEOHYDROLOGY IN SOLVING WATER MANAGEMENT PROBLEMS IN AGRICULTURE,
Institute for Land and Water Management Research Wageningen (Netherlands).
For primary bibliographic entry see Field 04B.
W72-13726

ECONOMIC EFFICIENCY IN THE ALLOCATION OF IRRIGATION WATER OVER TIME,
Oklahoma Water Resources Research Inst., Stillwater.
For primary bibliographic entry see Field 06B.
W72-13823

PROBLEMS IN THE HEAT AND WATER REGIME OF AGRICULTURAL LANDS (VOPROSY TEPLOVOGO I VODNOGO REZHIMA SEL'SKOKHOZYAYSTVENNYKH POLEY).

Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut, Trudy No 102, Moscow, 1971. 139 p.

Descriptors: *Heat balnace, *Water balance, *Land, *Agriculture, Agroclimatology, Meteorology, Precipitation (Atmospheric), Radiation, Temperature, Evaporation, Crops, Crop

response, Crop production, Plant physiloogy, Photosynthesis, Soil moisture, Moisture deficit, Water storage, Irrigation, Grasslands.
Identifiers: *USSR, *Ukraine, *Agrometeorology, Phytometry, Grapes.

Designed for hydrometeorologists and agriculturists, this collection of 13 papers presents information on the water relations and temperature of field soils in different parts of the Ukraine. Methods are given for calculating solar radiation absorbed by crops and water storage in soil planted to winter wheat. Other topics examined include: (1) measurement of the physiological responses of witner wheat and corn to environmental factors; (2 control of evaporation losses from soil through chemical alteration of soil-moisture characteristics; and (3) cultivation of winter wheat in semiarid regions of the Ukraine. Special emphasis is placed on climate and soil-moisture availability as they affect photosynthesis and productivity of sugar beets and yield and sugar content of grapes. (Jesefson-USGS)
W72-13858

LET YOUR IRRIGATION SYSTEM DO ALL THE WORK,
G. E. McConnell.
American Fruit Grower, Vol 91, No 5, May 1971, p 16-18. 6 fig.

Descriptors: *Subsurface irrigation, *Irrigation systems, *Crop production, *Frost prevention, *Pesticides, Fertilizers, Spatial distribution, Sprinkler irrigation, Water wells, Pumps, Lateral conveyance structures, Chemicals, Hazards, Fruit crops, Water conservation.

An integrated underground irrigation system can be used to irrigate, protect crops from frost, and apply pesticides and fertilizers. Design and construction of a permanent watering system are presented. Triangular spacing of sprinklers gave the best coverage. The system is feasible for any intensively used land whose irrigation is economical. The installed cost of the underground system was less than half the cost of a traditional portable aluminum pipe system. Water well pumps were selected because of flat performance curves. A commercial air compressor cleans all laterals easily. Different chemicals and fertilizers have been applied by this system which also reduces frost hazard. (Popkin-Arizona)
W72-13911

SALT RIVER PROJECT 1971 ANNUAL REPORT.
Salt River Project, Phoenix, Ariz. Agricultural Improvement and Power District.
For primary bibliographic entry see Field 04A.
W72-13913

MAN--THE DESERT FARMER,
Arizona State Museum, Tucson.
J. E. Ayres.
In: Hydrology and Water Resources in Arizona and the Southwest, Proceedings, Arizona Section-American Water Resources Association and the Hydrology Section-Arizona Academy of Science, April 22-23, Tempe, Vol 1, p 373-379, 1971. 5 ref.

Descriptors: *History, *Arid lands, *Arizona, *Irrigation practices, *Soil properties, Soil environment, Soil texture, Saline soils, Arroyos, River basins, Microenvironment, Crops, Agriculture, Irrigation canals, Irrigation systems, Environmental effects.
Identifiers: *Archaeology, *Prehistoric water exploitation.

The pre-Columbian Hohokam Indians occupied the major river drainages of Central Arizona, and have been the subject of much intense archaeological research. Evidence indicates that the Hohokam began using river water for crop irrigation about 300 B.C., and modified and improved their irrigation systems over time, until the maximum extent of these systems was achieved about 900 A. D. Two types of water control seem to have been utilized: (1) the direct exploitation of rivers through the use of irrigation canals, (2) indirect use through controlled runoff within microdrainages at higher elevations before it reached the rivers. At first, probably only those parcels of land with optimal soils and drainage were used, but apparently population increases fostered by agriculture itself, combined with increasing social and political complexity, necessitated more and more exploitation of marginal lands. Eventually soil problems increased, imposing severe limitations on agriculture. These involved salt and alkali accumulation due to inadequate drainage, soil density and water logging. Additionally, the extension of cropping required the clearing of natural vegetation, which resulted in increased erosion and decreased available native food resources for periods when crops failed. The culture vanished completely about 1450 A. D., probably mainly because of their manner of river exploitation for irrigation. More recent archaeological studies are concentrating not only on river use but also on river abuse. (Casey-Arizona)
W72-13919

WHEELER-DEALING: JACKPOT IN HAY,
T. Capener.
Western Livestock Journal, Vol 49, No 15, February 1971, p 32-33. 3 fig.

Descriptors: *Irrigated land, *Hay, *Crop production, *Sprinkler irrigation, *Carrying capacity, Nevada, Feeding rates, Rotations, Droughts, Farm management, Land clearing, Burning, Water resources development, Water management (Applied), Water control, Fertilization, Planting management, Revegetation.

In 6 years, the J. K. Wheeler ranch in Jackpot, Nevada has doubled in the number of irrigated acres and increased hay production and carrying capacity by efficient wheel-moved sprinklers, fencing, and feeding rotation. Irrigated acres in the drought-ridden ranch increased from 400 to 800 acres. Hay production increased from less than a ton per acre to between 3 and 5 tons on 2-1/2 cuttings in 90 to 100 growing days. Carrying capacity on the 6500 acre ranch is now at 1000 head of cattle, compared to 350 cattle 6 years ago. Major improvements included: clearing, burning and levelling dried-up river bottom land; gaining control of existing water and developing new water; fertilizing, planting and replanting all 800 acres; and beginning a flexible hay-making program that allows the crop to be baled or made into haylage. The sprinkler irrigation system is explained. (Popkin-Arizona)
W72-13921

WATER AND SOME NUTRIENTS LOSSES BY DEEP PERCOLATION AS INFLUENCED BY THE DEPTH OF WATER TABLE,
Ministry of Agriculture, Cairo (Egypt). Soils Dept.
For primary bibliographic entry see Field 02G.
W72-13923

EFFECTS OF ENVIRONMENTAL CONDITIONS AND THE COADMINISTRATION OF GROWTH RETARDANTS ON THE RESPONSE OF SUGARCANE TO FOLIAR TREATMENT WITH GIBBERELLIN,
Tate and Lyle Ltd., Keston (England). Research Lab.
R. A. Yates.
Agron J. Vol 64, No 1, p 31-35. 1972. Illus.
Identifiers: *Crop production, *Plant growth regulators, Coadministration, Dalapon, Environment, Gibberellin, Growth, Moisture, Retardants, Saccharum M spp, Soils, Sucrose, Sugarcane M, Temperature, Treatment, Uracil.

Poor yields of sucrose from sugarcane are often associated with low sucrose:cane ratios, particularly when climatic conditions tend to favor stem elongation rather than sucrose accumulation. Plant growth regulators may be used to modigy environmental effects on the growth of sugarcane and thus alter the balance between utilization and storage of sucrose. The influence of temperature, soil moisture, and the coadministration of plant growth retardants on the response of sugarcane to treatment with gibberellic acid was investigated. Single foliar applications of GA to commercial sugarcane varieties (interspecific hybrids of Saccharum) stimulated stem elongation for from 2-6 wk, but this response was not reflected in higher cane yields unless the plants were harvested within 6 wk of treatment. A second application of GA at 4 wk prolonged the growth response. In the field low temperatures were associated with the more prolonged growth responses, which were of smaller amplitude. Moisture stress had no apparent effect on GA response. No corrections were evident between environmental conditions or application rates and the duration of growth responses in greenhouse trials, but the amplitude increased with application rate within the range of 25-200 ppm. Three-5 immature or semimature internodes were affected. In field trials under warm conditions a period of growth retardation followed the initial GA-induced growth stimulation. This did not occur in greenhouse trials. Stem-sugar concentrations fell during the growth-stimulation phase, but recovered as growth rates reduced. Attempts were made to accentuate this recovery, and so to increase the accumulation of sugars, by coadministration of growth retardants with GA. Dalapon had a delayed effect on cane growth, slightly curtailing the duration of the GA response, and suppressing growth thereafter. The phase of growth suppression was accompanied by increased stem sugar concentration in greenhouse-, but not in field-trials. Sodium silicate (at up to 200 ppm) had no significant effect on growth or sugar accumulation and did not modify the response to GA. Treatment with azauracil (at up to 400 ppm) strongly inhibited cane growth and increased stem-sugar concentrations, but showed no significant interaction with GA.--Copyright 1972, Biological Abstracts, Inc.
W72-13924

CONTROLLED-ENVIRONMENT VEGETABLE PRODUCTION: RESULTS OF TRIALS AT PUERTO PENASCO, MEXICO, 1968-1970,
Arizona Univ., Tucson. Environmental Research Lab.
M. H. Jensen, and H. M. Eisa.
1972. 118 P, 5 FIG, 66 TABLES.

Descriptors: *Greenhouses, *Environmental effects, *Soil-water -plant relationships, *Mexico, Nutrient requirements, *Crop response, *Vegetable crops, Plant growth, Growth chambers, Coasts, Deserts, Heat exchangers, Desalination apparatus, Humidity, Mist irrigation.
Identifiers: *Waste heat, Gulf of California.

Many of the world's presently uninhabited deserts could be made productive, even attractive for settlement, if such necessities as food were present. Fresh vegetables often are scarce in many existing desert communities. When available, they usually are poor in quality or very expensive. To grow them, there must be water for irrigation and a conducive environment. Temperatures in most arid areas are adequate for agriculture during most of the year, but sandstorms and insect invasions often preclude horticultural production, and providing water for open-field irrigation may be costly. Experiments are being conducted by the Universities of Arizona and Sonora in growing vegetables in the desert in controlled-environment, air-inflated plastic greenhouses. Waste heat for desalting seawater is captured from diesel-electric generator sets. The fresh water then is used to irrigate crops inside the structures. Crops are grown directly in the beach sand. A prototype

unit is in operation in Puerto Penasco, Sonora, Mexico, on the east coast of the Gulf of California. The report of the 1968-1970 trials describes the greenhouse structure and environment, the use of beach sand as a growing medium, planting procedures and nutrient solutions, irrigation systems, pollination, pest and disease control, and fertilizers used for the vengetables and fruits grown.
W72-13926

SOIL WATER REGIME IN ECONOMIC EVALUATION OF SALINITY IN IRRIGATION,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
For primary bibliographic entry see Field 03C.
W72-13932

RURAL ENVIRONMENTAL ASSISTANCE PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Agricultural Stabilization and Conservation Service, Washington, D.C. Conservation and Land Use Programs.
For primary bibliographic entry see Field 05G.
W72-13953

AUTHORIZED CHINA MEADOWS DAM AND RESERVOIR LYMAN PROJECT, WYOMING (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Salt Lake City, Utah. Region 4.
For primary bibliographic entry see Field 08D.
W72-13963

SIMULTANEOUS DETERMINATION OF SHORT-PERIOD PHOTOSYNTHESIS AND EVAPOTRANSPIRATION,
Nebraska Univ., Lincoln. Dept. of Horticulture and Forestry.
N. J. Rosenburg.
Available from the National Technical Information Service as COM-72-10455, $3.00 in paper copy, $0.95 in microfiche. Nebraska Agricultural Experiment Station Horticulture and Forestry Progress Report No 91, February 1972. 61 p, 29 fig, 3 tab, 14 ref, 3 append. NOAA Grant E-293-68 (G).

Descriptors: *Agronomy, *Soil water, *Photosynthesis, *Evapotranspiration, *Experimental farms, Crops, Crop response, Analytical techniques, Soybeans, Measurement, Instrumentation, Plant growth, Soil-water-plant relationships, Weather, Canopy.

Methods are described for simultaneously determining photosynthesis and evapotranspiration and thus the water use efficiency (CO2 fixed/unit of water consumed) in fields of growing crops. Water use efficiency can be determined for periods as short as 15 min. The methods depend upon the assumption that the exchange coefficients for water vapor and CO2 are identical. Recent coefficients for water vapor are determined by lysimetric and energy balance methods, both of which give comparable results. CO2 concentrations and gradients were measured over soybean and grass fields early and late in the 1969 growing season. IT WAS POSSIBLE TO DISTINGUISH DIFFERENCES IN THE CO2 concentration in air near canopy top. CO2 concentration was lowest over soybeans. The methods developed were used to distinguish differences in water use efficiency caused by a reflectant applied to a maturing soybean crop. Reduction in water use efficiency was noted on a very cloudy day shortly after application of the treatment. Later, no effect of treatment was noted. Instrumentation in development for measuring the below-canopy sources of CO2 produced by soil, root and plant respiration is described. (Woodard-USGS)
W72-14009

SPRINKLE AND TRICKLE IRRIGATION OF GREEN PEPPER IN AN ARID ZONE,
Hebrew Univ., Jerusalem (Israel). Dept. of Irrigation.
D. Goldberg, and M. Shmueli.
Hortscience. 6 (6Sec.1): 559-562. Illus. 1971.
Identifiers: *Arid zones, Capsicum-Annuum-D, Chloride, Development, Green peppers, Growth, Irrigation, Leaf, *Pepper-D, Root, *Sprinkle irrigation, *Trickle irrigation, Yield, Zone.

Pepper plants (Capsicum annuum L. cv. 'California Wonder') were sprinkle and trickle irrigated, each at 2 different frequencies, during the growing season from Sept. to April. Yield, leaf growth, and root development were all greater with trickle than with sprinkle irrigation. Frequency of water application had a slight, but non-significant effect. Yield tended to decrease when the plants were sprinkle irrigated daily. With trickle irrigation, the infrequent interval, every 5 days, tended to reduce the yield. Leaf chloride content was considerably greater under sprinkling, especially at the frequent interval.--Copyright 1972, Biological Abstracts, Inc.
W72-14089

SPRINKLE, FURROW AND TRICKLE IRRIGATION OF MUSKMELON IN AN ARID ZONE,
Hebrew Univ., Jerusalem (Israel). Dept. of Irrigation.
M. Shmueli, and D. Goldberg.
Hortscience. 6 (6 Sec. 1): 557-559, Illus, 1971.
Identifiers: Arid zones, Chlorides, Cucumis-Melo-D, *Furrow irrigation, Growth, Irrigation, *Muskmelon-D, Salts, Soils, *Sprinkle irrigation, *Trickle irrigation, Yield, Zone.

In a comparison of sprinkle, furrow and trickle irrigation applied during the growing season from Aug. to Dec. to muskmelon (Cucumis melo L. cv. 'Haogen-2'), vegetative growth was found more rapid and yields were earlier and higher with the trickle method. No yield differences were detected between sprinkle and furrow irrigation. Salt accumulation on the leaves was greater with sprinkling than with the other 2 methods which do not wet the foliage. The chloride concentration in the leaves was also high throughout the entire growing season with sprinkle irrigation. Soil chloride content during the growing season varied according to the method of irrigation.--Copyright 1972, Biological Abstracts, Inc.
W72-14090

INVESTIGATIONS ON RAINY SEASON POTATO IN THE PLATEAU REGION OF CHOTANAGPUR,
Agricultural Research Inst., Ranchi (India).
R. Tiwari, M. S. S. Rao, and S. C. Mandal.
Ranchi Univ J Agric Res, 4: 39-46, Illus, 1969.
Identifiers: *Chotanagpur (India), Fertilizers, Nutrition, Plateaus, *Potato-D, Rainy season, Crop yield.

Varietal X manurial trials showed that the new cultivar 'Kufri Chandramukhi' significantly excelled 'Kufri Kuber' in yield when cultivated as a rainy season crop. The use of 60 kg-75 kg/ha of P2O5 increased the yield significantly. The 1st wk of July onwards was the optimum time for sowing. Planting whole tubers at ground level gave better yields as compared to sowing at other depths.--Copyright 1972, Biological Abstracts, Inc.
W72-14091

A DEVICE FOR MEASURING AND RECORDING THE AMOUNT AND DURATION OF FREE WATER ON VEGETATION IN THE FIELD,
Agricultural Research Service, Orlando, Fla. Entomology Research Div.
C. W. Mc Coy, A. J. Hill, and G. E. Horanic.
J Econ Entomol, 65 (1): 135-138, Illus, 1972.
Identifiers: *Citrus-D, Duration, *Foliage, *Measurement, Recording, Vegetation.

A portable electronic apparatus was constructed to measure the quantity of moisture and its duration on citrus foliage. It consists of a sensor and recorder in a balanced circuit independently powered with direct current. Current flowing through the sensor was recorded as an impulse on a recording chart. The more moisture on the sensor, within limits, the lower the electrical resistance and the higher the scale deflection. Duration of moisture was determined as the time between the 1st and last impulses and from the chart speed. A single sensor situated beyond the tree canopy and elevated to about 4 ft above ground simulated overall leaf conditions most closely. Sensors performed adequately for 6 mo., but generally were changed after 4 mo.--Copyright 1972, Biological Abstracts, Inc.
W72-14094

THE EFFECT OF FRUITING UPON TRANSPIRATION RATE AND STOMATAL OPENING IN APPLE LEAVES,
P. Hansen.
Physiol Plant, 25 (2): 181-183, 1971.
Identifiers: *Apple-D, *Fruiting, Leaves, Malus-Domestica-D, Microscopy, Nitrogen, Potassium, *Stomatal opening, *Transpiration.

The uptake of water by apple trees (Malus domestica 'Golden Delicious') was measured in a pot experiment and was found to be much greater in apple trees carrying many fruits than in comparable specimens without fruits. The main reason seemed to be differences in the transpiration rates of the leaves. This was corroborated by microscopic investigations which showed a higher degree of stomatal opening in the fruiting trees. In some cases minor reductions in water uptake per tree were caused by reducing the supplies of K and N.--Copyright 1972, Biological Abstracts, Inc.
W72-14097

FERTILIZER TECHNOLOGY AND USE.

2nd Edition, 611p, Illus, Olson, R. A. (Ed.), Soil Science of America, Inc.: Madison, Wis., 1971, Pr. $10.00.
Identifiers: Book, *Crops, *Fertilizer technology, Water pollution control.

This book contains 18 papers on fertilizer technology and the current applications in this field. Among the new technologies introduced in this volume are development and current status of the fertilizer solutions industry; advanced modes of transport including pipeline distribution of fertilizers; development and role of delayed release fertilizer materials; and formulation and marketing of fertilizer-pesticide combinations. New chapters include a coverage of crop quality in relation to fertilizer use; the predication of crop nutrient requirements through soil and foliar analyses; the behavior of fertilizers in acid, alkaline and flooded soils; the beneficial use of the tremendous quantities of waste products emanating from modern society as fertilizer supplements by undergoing depollution in soil; and a scientific treatise on the potential role of fertilizers as pollutants. These innovations should be of interest to the student of fertilizer technology as well as the industry representative interested in the sale of chemical fertilizers. A glossary of common and scientific names of plants, diseases and insects referred to in this book is followed by a subject index which ends the book.--Copyright 1972, Biological Abstracts, Inc.
W72-14101

THE QUALITY OF 'RED DELICIOUS' APPLES AS AFFECTED BY OVERTREE SPRINKLER IRRIGATION,
North Carolina State Univ., Raleigh. Dept. of Horticultural Science.
C. R. Unrath.
J Am Soc Hort Sci, 97 (1): 58-61, 1972.

Identifiers: *Apples-D, Bitter-Pit, *Color, Fruit, Irrigation, Shape, Size, Solids, *Sprinkler irrigation.

The trees were spot-picked weekly, based on acceptable color to meet grade standards. Harvesting was completed one week earlier on trees receiving overtree sprinkler irrigation as compared to those with undertree or no irrigation. Fruit from trees which received overtree irrigation had greater surface coloration and nearly twice as much surface area with good solid red color as fruit which received undertree or no irrigation. Overtree irrigation improved fruit size and shape during 1969 but not 1970; increased soluble solids, and reduced cork spot and bitter pit in 1970. Lower firmness of overtree irrigated apples in 1969 was attributed to their greater size. Irrigation (over and undertree) had no influence upon internal breakdown measured after 4 mo. of storage at 32 deg F.--Copyright 1972, Biological Abstracts, Inc.
W72-14103

THE EFFECT OF DISTANCE FROM THE TRICKLERS ON SOIL SALINITY AND GROWTH AND YIELD OF SWEET CORN IN AN ARID ZONE,
Hebrew Univ., Jerusalem (Israel). Dept. of Irrigation.
D. Goldberg, and M. Shmueli.
Hortscience, 6 (6 Sec. 1): 565-567, Illus, 1971.
Identifiers: Arid zones, *Corn-M, Growth, Moisture, *Soil salinity, Tension, *Tricklers, Yield.

The effect of the distance between crop row and tricklers on growth and yield of sweet corn, and on soil moisture and salinity was studied. The maximum yield was obtained when the nozzles were located 5-25 cm from the plants. Less vigorous vegetative development resulted when the tricklers were at a distance of 50 cm. The salt concentration in the 0 to 30-cm soil layer increased with distance from the trickle line. Soil water tension was almost constant throughout the irrigation cycle at distances of 5-35 cm, it was lower at 0 cm from the tricklers, and markedly higher at 50 cm from the irrigation line.--Copyright 1972, Biological Abstracts, Inc.
W72-14105

EMERGENCE, EARLY GROWTH, AND SALINITY OF FIVE VEGETABLE CROPS GERMINATED BY SPRINKLE AND TRICKLE IRRIGATION IN AN ARID ZONE,
Hebrew Univ., Jerusalem (Israel). Dept. of Irrigation.
M. Shmueli, and D. Goldberg.
Hortscience, 6 (6 Sec. 1): 563-565, Illus, 1971.
Identifiers: Arid zone, Crops, Cucumber-D, *Germination, Growth, Irrigation, Muskmelon-D, Onion-M, Pepper-D, Salinity, Salts, *Sprinkle irrigation, Tomato-D, *Trickle irrigation, Vegetables.

Field experiments were conducted to test the emergence, early growth, and salt build-up in soil and leaves with 5 vegetable crops germinated by sprinkle and trickle irrigation using saline water. In some of the crops (cucumber, tomato, pepper) trickle irrigation shortened the time until emergence and the stand was more uniform. Other crops (muskmelon, onion) responded in a similar manner to both irrigation methods. Seedling development was good with both methods. Trickling produced a higher salt concentration in the 0 to 3-cm soil layer of the crop row, although this had no apparent effect on emergence, seedling weight, or chloride content of the leaves.--Copyright 1972, Biological Abstracts, Inc.
W72-14106

EFFECT OF MOISTURE STRESS AND INDOLEBUTYRIC ACID ON ROOTING OF STEM CUTTINGS OF POMEGRANATE (PUNICA GRANATUM L.),
Udaipur Univ. (India).
K. S. Chauhan, and Jayendra Singh.
Indian J Agric Sci. 41 (4): 293-296. 1971.
Identifiers: Growth, *Moisture stress, *Pomegranate-D, Punica-Granatum-D, Rooting, Soil, Stem cuttings, *Indolebutyric acid.

The highest percentage of survival (90%) and the maximum number of primary roots/cutting occurred in cuttings planted at a moisture level of 20.14% and treated with 50 ppm IBA. Overall best results were obtained when cuttings were treated with IBA at 50 ppm and planted at a moisture level of 15.95%.--Copyright 1972, Biological Abstracts, Inc.
W72-14123

CELL SIZE IN RUSSET BURBANK POTATO TUBERS WITH VARIOUS LEVELS OF NITROGEN AND SOIL MOISTURE TENSIONS,
Western Region Research Lab., Berkeley, Calif.
R. M. Reeve, H. Timm, and M. L. Weaver.
Am Potato J. 48 (12): 450-456. Illus. 1971.
Identifiers: Cell size, Moisture, *Nitrogen, Parenchyma, Potato-D, Russet-Burbank, *Soil moisture, Starch, Storage, Potato tubers.

Russet Burbank potatoes were grown at levels of added N of 0, 135, and 270 kg/ha and soil moisture tensions (SMT) of 0.5 and 1.0 atm. With all combinations, there was a consistent gradient of larger to smaller starch-storage parenchyma cells from stem end to bud end of mature tubers. Stem and bud ends of tubers grown at a SMT of 0.5 atm with N had smaller cortical and pith (innermost medullary or water-core) cells than did ends of tubers grown without N. Perimedullary tissues of bud ends of tubers receiving N likewise contained smaller cells than did corresponding tissues of tubers grown without N. No pronounced differences in cell size were found in tissues from the midsections. In bud-end tissue of tubers grown at a SMT of 1.0 atm, there were no consistent differences in cell size with respect to N levels. However, pith, perimedullary, and cortical tissues of the midsections and stem ends of tubers receiving N had smaller cells than did corresponding tissues from tubers without N. The different patterns of cell size in tubers grown at different SMT indicate that the effects of N may be influenced by soil moisture.--Copyright 1972, Biological Abstracts, Inc.
W72-14124

THE EFFECT OF LIGHT AND HUMIDITY ON ABSORPTION AND DEGRADATION OF DIPHENAMID IN TOMATOES,
Missouri Univ., Columbia. Dept. of Plant Pathology.
D. P. Schultz, and B. G. Tweedy.
J Agric Food Chem. 20 (1): 10-13. Illus. 1972.
Identifiers: *Absorption, *Degradation, *Diphenamid, Herbicides, Humidity, Light, Lycopersicon-Esculentum-D, *Tomatoes-D.

The effect of various light and relative humidity regimes on the absorption and degradation of N,N-dimethyl-2,2-diphenylacetamide (diphenamid) by tomatoes (Lycopersicon esculentum Mill.) was studied by extracting plants which were grown for 24, 48, and 120 hr in a nutrient solution containing 14C-diphenamid. Plants grown under low light, low humidity conditions absorbed more diphenamid than those grown under high light, high humidity. Extracts of plants grown under high light, high humidity conditions contained a lower percentage of diphenamid and a higher concentration of a glucose-diphenamid complex than those grown under low light, low humidity conditions. The concentration of diphenamid increased in the shoots of plants grown under low light, low humidity but remained constant in plants grown under high light, high humidity. The concentration of the glucose-diphenamid complex in shoot extracts was nearly the same at all harvest periods and in all treatments.--Copyright 1972, Biological Abstracts, Inc.
W72-14125

EFFECTS OF CULTURAL PRACTICES AND FERTILIZERS ON SUGAR BEET QUALITY,
Broom's Barn Experiment Station, Bury St. Edmonds (England).
For primary bibliographic entry see Field 05C.
W72-14139

STUDIES ON THE MECHANISMS OF ACTION OF THE ANTITRANSPIRANT PHENYLMERCURIC ACETATE, AND ITS PENETRATION INTO THE MESOPHYLL,
Lancaster Univ., Bailrigg (England). Dept. of Biological Sciences.
For primary bibliographic entry see Field 02I.
W72-14149

CROPPING PATTERN IN RELATION TO WELL IRRIGATION,
Ranchi Univ. (India).
K. N. P. Verma, D. K. Singh, and Randhir Sinha.
Ranchi Univ J Agric Res, 4: 31-34, Illus, 1969.
Identifiers: *Cropping patterns, Irrigation, Vegetables, Wheat-M, *Well irrigation.

The provision of irrigation from even a minor source such as a well makes it possible to shift cropping pattern from traditional subsistence nature to market oriented one. Cropping pattern both on irrigated and unirrigated farms was mainly food crop dominated, however, on irrigated farms area under cash crops, such as, vegetables shared as much as 31% of gross cropped area as against only 3% on unirrigated farms. On an average the intensity of cropping was 1 1/2 times higher on irrigated farms. The analysis of cropping pattern of the same farm holdings at 2 time periods, one before and the other after the construction of irrigation well (s), revealed that with the construction of irrigation well (s), new crops like vegetables (21%) and wheat (3%) entered the cropping pattern. The intensity of cropping also increased on each size group of farm and on an average it rose from 101.32 to 127.15%.--Copyright 1972, Biological Abstracts, Inc.
W72-14150

EFFECT OF IRRIGATING WHEAT CROP AT DIFFERENT STAGES,
Maize Research Station, Chhindwara (India).
K. K. Mandloi, and P. S. Kushwaha.
Jnkvv (Jawaharlal Nehru Krishi Vishwa Vidyalaya) Res J, 4 (1/2): 93-94, 1970.
Identifiers: Crops, *Irrigation, *Wheat-M, *Tilling.

During periods of water shortage, it is better to irrigate the wheat crop at the stage of tilling rather than heading.--Copyright 1972, Biological Abstracts, Inc.
W72-14151

A NOTE ON THE RESPONSE OF THE RICE VARIETIES TO VARYING WATER LEVELS,
Jawaharlal Nehru Agricultural Univ., Jabalpur (India).
P. D. Khare, K. K. Sharma, and M. N. Shrivastava.
Jnkvv (Jawaharlal Nehru Krishi Vishwa Vidyalaya) Res J, 4 (1/2): 105, 1970 (1971).
Identifiers: *Rice-M, *Water levels, Irrigation, Crops.

Fluctuation in yield under different water levels was higher in 'Taichung (Native)-1' and minimum in 'Nurin-1' cultivar. 'Taichung (Native)-1' recorded a sudden increase in yield under 5 cm

over saturated treatment and decreased afterwards.-aCopyright 1972, Biological Abstracts, Inc.
W72-14152

EFFECT OF SOIL-MOISTURE STRESS ON THE LIPID QUALITY OF MATURED WHEAT GRAINS,
Punjab Agricultural Univ., Ludhiana (India).
O. S. Singh, P. S. Sukhija, M. L. Nagpal, and I. S. Bhatia.
Indian J Agric Sci, 41 (4): 300-304, 1971.
Identifiers: Grains, *Lipid quality, *Soil moisture stress, Triticum-Aestivum-M, *Wheat-M.

Two high-yielding dwarf wheat (Triticum aestivum L.) cultivars 'S 308' and 'Kalyan Sona 227' were subjected to a soil-moisture tension equivalent to 12 atmospheres at the tillering, early boot, late boot and the late dough stages. The stress at the tillering and early boot stages mostly decreased the lipid content per grain. However, the ratio of polar:non-polar lipids remained unaffected regardless of the growth state at which water stress was applied. Triglyceride fraction of the non-polar lipids decreased considerably in the order of the late dough stage < tillering < early boot and late boot stage. At the late boot stage there was a larger amount of lower fatty acids and palmitic acid both in the total lipids and the glyceride fraction.--Copyright 1972, Biological Abstracts, Inc.
W72-14155

REACTION OF SOIL FUNGI AND OTHER MICROORGANISMS TO VARIOUS LEVELS OF NITROGEN FERTILIZATION AND IRRIGATION OF COCKSFOOT (DACTYLIS GLOMERATA L.). (IN POLISH),
For primary bibliographic entry see Field 05C.
W72-14158

DETERMINATION OF THE RESERVE OF AVAILABLE PHOSPHATES IN IRRIGATED SOILS (IN RUSSIAN),
For primary bibliographic entry see Field 05B.
W72-14169

EROSION CONTROL PRACTICES IN PRIMARY CULTIVATION OF SOIL ON SLOPES OF THE CARPATHIANS, (IN RUSSIAN),
For primary bibliographic entry see Field 04D.
W72-14170

SOIL EROSION STUDIES IN THE PRESNOVSKII SOVKHOZ IN THE PAVLODAR OBLAST, (IN RUSSIAN),
For primary bibliographic entry see Field 02J.
W72-14171

PROBLEMS OF INTERACTION OF MINERAL FERTILIZERS AND IRRIGATION ON CERTAIN TYPES OF HUNGARIAN SOILS, (IN RUSSIAN),
B. Dobretseni.
Identifiers: *Fertilizers, *Hungary, Irrigation, *Minerals, Soil types.

At the current level of supply of mineral fertilizers on rich irrigated soils, it is inexpedient to apply large doses of fertilizers at the expense of less fertile soils. The latter should be given large doses of mineral fertilizers under irrigation.--Copyright 1972, Biological Abstracts, Inc.
W72-14172

IMPROVEMENT OF SOILS BY CULTIVATION IN THE NON-CHERNOZEM ZONE, (IN RUSSIAN).

Moskovskii rabochii: Moscow. 1970. 175 p. Illus.
Identifiers: Book, *Cultivation, *Fertility, Legume-D, *Nonchernozem soils, USSR.

The following topics were studied: the theoretical principles of deepening the arable layer of sod podzolic soils and improving its fertility, the methods for its improvement by cultivation, crop rotations, manuring, liming, the role of legumes in improvement of fertility, the cultivation and technical practices and regulation of the water regime of soils.--Copyright 1972, Biological Abstracts, Inc.
W72-14180

CERTAIN FEATURES OF RESPIRATORY METABOLISM OF PLANTS UNDER CONDITIONS OF AN INCREASING WATER DEFICIENCY, (IN RUSSIAN)
Kazan State Univ., (USSR).
L. K. Gordon, and A. A. Bichurina.
Dokl Akad Nauk SSSR Ser Biol. 192 (6): 1384-1386. 1970.
Identifiers: Water deficiency, *Glycolysis, *Respiratory metabolism, *Pentose phosphate, Phosphorus, Plants, Water, *Wheat-M.

Studies concerning the relation of individual respiratory pathways, glycolytic and pentose phosphate, in wheat plants showed that under moderate soil drought conditions the proportion of glycolysis in the overall respiratory balance increases. In severe drought the proportion of glycolysis drops and the pentose phosphate pathway predominates. The decrease on the part of glycolysis can apparently be related with a P shortage, which is usually observed when there is a marked water deficiency. P deficiency is one of the main factors limiting the glycolytic process.--Copyright 1972, Biological Abstracts, Inc.
W72-14195

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

A STATISTICAL ANALYSIS OF BASE-FLOW FLOOD DISCHARGE DATA,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 02E.
W72-13700

REVIEW OF GEOHYDROLOGICAL ACTIVITIES IN THE NETHERLANDS SINCE WORLD WAR II, IN PARTICULAR OF THE GOVERNMENT INSTITUTE FOR WATER SUPPLY,
Rijksinstituut voor Drinkwatervoorziening, The Hague (Netherlands).
For primary bibliographic entry see Field 02F.
W72-13721

BURIED CHANNEL AQUIFERS AND PRESENT OPEN DRAINAGE SYSTEM OF EAST GELDERLAND, THE NETHERLANDS,
Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences.
For primary bibliographic entry see Field 02F.
W72-13722

RIPRAPPED BASINS FOR CULVERT OUTFALLS,
Colorado State Univ., Fort Collins; and Idaho Univ., Moscow.
For primary bibliographic entry see Field 08A.
W72-13751

EVALUATION OF A DETERMINISTIC MODEL FOR PREDICTING WATER YIELDS FROM SMALL AGRICULTURAL WATERSHEDS IN VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Research Div.
For primary bibliographic entry see Field 02A.
W72-13824

FLOOD PLAIN INFORMATION, TALKEETNA RIVER-SUSITNA RIVER-CHULITNA RIVER, TALKEETNA, ALASKA.
Corps of Engineers, Anchorage, Alaska.

Flood Plain Report, June 1972. 28 p, 11 fig, 10 plate, 4 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, *Alaska, Regional flood, Flood forecasting, Flood control, Historic floods, Peak discharge, Flood profiles, Flood protection, Hydrologic data, Streamflow.
Identifiers: *Talkeetna (Alaska), Standard flood, Intermediate Regional flood.

Flooding from streams in the Talkeetna, Alaska area is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights, and other technical data. The flood plain within the village of Talkeetna is occupied by residential and commercial developments. The railroad, highway, streets and utility lines, in addition to homes and businesses, are subject to flooding. This flood plain is only partially developed. Floods have occurred in September 1942 and August 1971. The 1942 flood is the highest of record (approximately 6 ft above flood stage) and is the only one that caused any significant damage. The Intermediate Regional flood rise is 8.3 ft above flood stage, and the Standard Project flood is 10.9 ft above flood stage. (Woodard-USGS)
W72-13836

TECHNIQUES OF STATISTICAL EVALUATION OF RUNOFF RESULTS OF PRECIPITATION MODIFICATION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-13841

CHANNEL NETWORK OF A BASIN AND FORMATION OF RUNOFF (RUSLOVAYA SET' BASSEYNA I PROTSESS FORMIROVANIYA STOKA VODY),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02E.
W72-13853

HYDROLOGIC INVESTIGATIONS, COMPUTATIONS, AND FORECASTS (VOPROSY GIDROLOGICHESKIKH ISSLEDOVANIY, RASCHETOV I PROGNOZOV).

Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut, Trudy No 97, Moscow, 1970. 160 p.

Descriptors: *Hydrology, *Hydrologic aspects, *Hydrologic data, *Forecasting, *Runoff forecasting, Rainfall-runoff relationships, Meteorology, Hydrographs, Inflow, Discharge (Water), Storms, Floods, Snowmelt, Ice, Rivers, River basins, Watersheds (Basins), Reservoirs, Grasslands, Mudflows.
Identifiers: *USSR, *European USSR, *Ukraine, *Moldavia, Carpathian Mountains, Danube River, Nomograms, Isohyetal lines.

Of interest to hydrologists, planners, planners, and water management specialists, this collection of 12 papers analyzes space-time characteristics of rainfall and runoff, and problems encountered in the computation and forecast of total, maximum, and daily runoff of storm and snowmelt floods on a number of rivers in the Ukraine and Moldavia. Formation of annual runoff in the southwestern Ukraine and Modlavia is examined in connection with calculation of average annual streamflow of ungaged rivers of the region. Ice formation on lower reaches of the Danube, storm precipitation in the steppe zone of the European USSR, and catastrophic mudflows in the Ivano-Frankovk and L'vov Oblasts in the Carpathians in early June 1969 are also described. (Josefson-USGS)
W72-13854

FORMATION, CALCULATION, AND REGULATION OF STREAMFLOW (FORMIROVANIYE, RASCHETY I REGULIROVANIYE RECHNOGO STOKA).

Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut, Trudy No 100, Moscow, 1971. 176 p.

Descriptors: *Streamflow, *Runoff, *Regulations, Meteorology, Precipitation (Atmospheric), Snow, Ice, Storms, Surface waters, Reservoirs, Rivers, Flood data, Flood profiles, Groundwater, Discharge (Water), Hydrographs, Sedimentation, Erosion, Irrigated land, Spring.
Identifiers: *USSR, *European USSR, *Ukraine, *Moldavia, Dnieper River, Storm precipitation.

Of interest to hydrologists and workers in planning organizations and water management institutes, this collection of 15 papers provides information on the formation and regulation of spring and storm runoff on rivers in the Ukraine and Moldavia. Procedures used to compute spring flood-wave movement in reservoirs on the Dnieper River are described in connection with the 75-year flood which occurred on the Lower Dnieper between Kiev and Kakhovka in March-April 1970. Preparation of operational forecasts of daily discharges of the Dnieper near Kiev is described together with techniques for calculating maximum spring runoff on small rivers in Moldavia. Flood data obtained from devastating floods in the Dniester, Prut, Seret, and Tisa River basins in June 1969 and May 1970 are analyzed to define and interpret flood profiles. Also examined are storm precipitation patterns in irrigated regions in the southern part of the European USSR and reservoir sedimentation in Moldavia. (Josefson-USGS)
W72-13857

METHOD FOR PREVENTING WATER LOSS FROM RESERVOIRS AND CHANNELS,
Witco Chemical Corp., New York. (Assignee).
H. Goldstein, H. T. Ingram, and R. J. Kufrin.
U. S. Patent No 3,555,828, 3 p, 10 ref; Official Gazette of the United States Patent Office, Vol 882, No 3, p 991, January 19, 1971.

Descriptors: *Patents, Reservoirs, Channels, *Water loss, *Seepage control, *Reservoir leakage, *Elastomers, *Polymers, Water yield improvement.

A liquid elastomeric polymer coating is applied over the soil bed of the reservoir or channel. The coating is cured to form a conforming, continuous, thin, cohesive water-impermeable membrane which inhibits water loss due to seepage. Two examples of the method are described. (Sinha-OEIS)
W72-13889

SALT RIVER PROJECT 1971 ANNUAL REPORT.
Salt River Project, Phoenix, Ariz. Agricultural Improvement and Power District.
1971, Annual Report, 32 p. 8 tab, 39 fig.

Descriptors: *Multiple-purpose projects, *Multiple-purpose reservoirs, *Water utilization, *Electric power production, *Water management (Applied), Annual, Arid lands, Arizona, Electric power, Federal Reclamation Law, Agriculture, Watershed management, Water rights, Irrigation, Water storage, Reservoirs, Groundwater, Water supply, Power plants, Demand, Computer programs, Model studies, Mathematical models, Environmental effects, Operating costs, Economics, Income.
Identifiers: *Salt River Project.

The Salt River Project provides electricity to a 2,900 square-mile area in 3 Arizona counties, and is the first multi-purpose project authorized under the Federal Reclamation Act. The agricultural improvement district has an affilitated association which participates in the management of 13,000 square miles of the Salt and Verde watersheds, administering 250,000 acres for water rights, irrigation transmission and distribution to the Project's water for agricultural, municipal, and industrial use. This report summarizes the Project's 1971 progress with regard to using electric revenues to support its water and irrigation operations. Water storage in the six reservoirs went from 1,090,552 to 1,014,578 acre feet (af) throughout the year. Water use totalled 1,207,201 af, as 723,493 from surface reservoirs and 483,708 af from aquifers. Forecasting was simulated by a computer-based mathematical model. Electrical demands will increase by 27% by 1976. New generating plants will be needed. Development is meeting environmental concern. A detailed economic analysis is presented. (Popkin-Arizona)
W72-13913

SEEDBED PREPARATION AND SEEDING METHODS TO ESTABLISH GRASSED WATERWAYS,
Agricultural Research Service, Sidney, Mont.
F. H. Siddoway, and R. H. Ford.
Journal of Soil and Water Conservation, Vol 26, No 2, March-April 1971, p 73-76. 2 fig, 3 tab, 2 ref.

Descriptors: *Seeds, *Grasses, *Channels, *Stability, *Soil conservation, Stabilization, Watershed management, Soil types, Dry farming, Great Plains, Experimental farms, Fertilizers, Probability, Plant growth, Crop production, Mulching, Spring, Autumn, Weeds, Arid lands.

Grassed waterways, which stabilize soils, is one of several conservation practices used in dry-land farming in the north central Great Plains. Experiments were conducted to determine if practical and relatively rapid methods of waterway stabilization could be developed to minimize the need for reshaping. The experimental design was a randomized split plot, replicated three times, with six grass establishment methods and two fertilizer rates. Treatment differences did not produce a better than 5% level of probability in terms of resultant seedling stand, vigor and plant production. Mulched waterways were fairly stable on both spring- and fall-seeded plots where satisfactory grass stands were established. Fertilization enhanced grass growth for seedling and the following year. Weed growth from fertilization produced greater stability. Grass successfully competed with weeds. There was no demonstrable advantage to seeding either in spring or fall. (Popkin-Arizona)
W72-13914

POLITICS AND THE COLORADO RIVER,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 06E.
W72-13915

THE SOILS OF THE WOODED DISTRICT OF THE SOUTHEASTERN MORNE DEPARTMENT: SOIL FORMATION AND GENERAL DATA ON WATER MANAGEMENT,
Institut National de la Recherche Agronomique, Paris (France).
For primary bibliographic entry see Field 02G.
W72-13918

MAN--THE DESERT FARMER,
Arizona State Museum, Tucson.
For primary bibliographic entry see Field 03F.
W72-13919

FUTURE WATER USE MODEL OF UTAH VALLEY,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
T. L. Huntzinger.
M.S. Thesis, December 1971. 206 p, 22 tab, 21 fig, 34 ref, computer programs. OWRR B-043-COLO (2).

Descriptors: *Water utilization, *Model studies, *Water management (Applied), *Alternative planning, *Water supply, Inter-basin transfers, Population, Urbanization, Industrial water, Water storage, Water conveyance, Water distribution (Applied), Forecasting, Water shortage, Colorado, Water demand.
Identifiers: *Utah Valley, Utah Lake.

The Utah Lake drainage area, along the western base of the Wasatch Mountains, is the site of Utah's most rapid population growth, industrial and urban expansion. There is no means of distributing excess water in the area. The Central Utah Project will provide additional water storage and conveyance to allow increased interbasin transfers and to distribute existing and imported water supplies. A model is presented of the water use and supply system in the area using water years 1945 to 1965 as a base; future water demands are estimated to the year 2020. The model accounts for changes in the water supply; shortages and surpluses under present and future conditions are determined. Various water management alternatives are evaluated. Computer listings, tables, figures and references are abundantly presented. (Popkin-Arizona)
W72-13928

DYNAMIC MULTISECTOR PROGRAMMING APPROACH TO REGIONAL WATER RESOURCE MANAGEMENT,
Tahal Consulting Engineers Ltd., Tel-Aviv (Israel). Research and Development Div.
For primary bibliographic entry see Field 06A.
W72-13933

ENGINEERING AND ECONOMIC EVALUATION OF THE RELIABILITY OF WATER SUPPLY,
Mekoroth Water Co., Tel-Aviv (Israel). Research Div.
For primary bibliographic entry see Field 06D.
W72-13936

SANDUSKY HARBOR, ERIE COUNTY, OHIO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 05G.
W72-13950

RED RIVER WATERWAY AND RED RIVER WATERWAY EMERGENCY BANK PROTECTION, MISSISSIPPI RIVER TO VICINITY OF INDEX, ARKANSAS, LOUISIANA, ARKANSAS, OKLAHOMA, AND TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 08A.
W72-13952

DIKED DISPOSAL AREA PROGRAM, DULUTH-SUPERIOR HARBOR, ST. LOUIS COUNTY, MINNESOTA AND DOUGLAS COUNTY, WISCONSIN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 05G.
W72-13954

DIVELY DRAINAGE AND LEVEE DISTRICT (DISTRICT 23), ILLINOIS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 08D.
W72-13955

LANEPORT, NORTH FORK AND SOUTH FORK LAKES, SAN GABRIEL RIVER, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Fort Worth, Tex.
For primary bibliographic entry see Field 08A.
W72-13956

AUTHORIZATION OF FEDERAL WATER PROJECTS (FINAL REPORT, DRAFT REVIEW),
National Water Commission, Arlington, Va.
For primary bibliographic entry see Field 06B.
W72-13957

KINGSTREE BRANCH FLOOD CONTROL PROJECT, SOUTH CAROLINA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.

Available from the National Technical Information Service as PB-206 101-D, $3.00 in paper copy. July 16, 1971. 35 p, 1 map, 2 tab.

Descriptors: *South Carolina, *Channel improvement, *Environmental effects, *Flood control, Land use, Non-structural alternatives, Canals, Dredging, Right-of-way, Flood damage, Community development, Flood plain zoning, Fisheries, Fish reproduction, Fish conservation, Reproduction.
Identifiers: *Environmental impact statement, *Kingstree Branch Project (SC).

The proposed project involves construction of a flood control project consisting of depth and width improvements to the existing canal at Kingstree, South Carolina. The construction and maintenance of the proposed project will have a long-term benefit with respect to flood damage. Measures will be taken to protect fish spawning grounds in the stream. Adjacent landowners will be required to furnish a portion of their property for construction and right-of-way purposes. Adverse environmental effects are limited to noise, dust, and inconvenience during project construction. Alternatives to the proposed plan which were studied included flood plain management, levees, reservoirs and alternative channel improvement schemes. The reduction in flood levels will enhance the long-term productivity of the adjacent lands by allowing them to be used to their fullest extent. Besides labor and material, the project contemplates no irretrievable commitment of resources. Comment was solicited and received from appropriate federal and state agencies. (Waldron-Florida)
W72-13960

FAIRPORT HARBOR, LAKE COUNTY, OHIO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.

Available from the National Technical Information Service as PB-205 791-D, $3.00 in paper copy. November 19, 1971. 12 p, 1 map, 4 illus, 2 dwg.

Descriptors: *Ohio, *Channel improvement, *Environmental effects, *Dredging, Coastal engineering, Turbidity, Sediment accumulations, Soil disposal fields, Water pollution sources, Navigable waters, Harbors, Lake Erie, Operation and maintenance, Breakwaters, Spoil banks, Alternate planning, Water pollution.
Identifiers: *Environmental impact statement, *Fairport Harbor (Ohio).

The work under consideration is the maintenance of completed channels and structures in the deep-draft navigation project for Fairport Harbor, Ohio. The project involves the maintenance of breakwaters and the dredging of about 400,000 cubic yards of sediment annually and dumping the material into Lake Erie. Dredging will cause short-term increases in turbidity and sedimentation in both dredging and disposal areas. The project will accelerate the introduction of polluted sediment into Lake Erie. Temporary turbidity is expected during working periods. Alternatives are either the discontinuance of maintenance or the construction of enclosed disposal areas. Dredging and maintenance are continuing activities with both short-term and long-term aspects which are not in conflict. The project contemplates no irretrievable commitment of resources. Comment has been solicited from interested federal, state and local agencies. (Waldron-Florida)
W72-13961

LORAIN HARBOR, OHIO (MAINTENANCE) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.

Available from the National Technical Information Service as PB-205 787-D, $3.00 in paper copy. November 9, 1971. 10 p, 5 map, 1 dwg.

Descriptors: *Ohio, *Channel improvement, *Environmental effects, *Breakwaters, Operation and maintenance, Dredging, Coastal engineering, Turbidity, Sediment accumulations, Soil disposal fields, Water pollution sources, Navigable waters, Harbors, Lake Erie, Spoil banks, Water pollution.
Identifiers: *Environmental impact statement, *Lorain Harbor (Ohio).

The work under consideration is the maintenance of completed channels and structures in the deep-draft navigation project for Lorain Harbor, Ohio. The project calls for the maintenance of breakwaters and the dredging of about 300,000 cubic yards of sediment annually and dumping in Lake Erie. Dredging will cause short-term increases in turbidity and sedimentation, both in dredging and disposal areas. The disposal of dredged material will cause adverse effects to the extent that polluted material is placed in Lake Erie at a more rapid rate than would result from natural processes. Alternatives are either discontinuance of maintenance or provisions for an enclosed disposal area. Dredging and maintenance are continuing activities with both short-term and long-term aspects which are not in conflict. No irretrievable commitment of resources is involved. (Waldron-Florida)
W72-13962

LITTLE RIVER INLET, NORTH CAROLINA AND SOUTH CAROLINA, NAVIGATION IMPROVEMENTS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.

Available from the National Technical Information Service as PB-206 056-D, $3.00 in paper copy. December 30, 1971. 24 p, 1 map, 2 tab.

Descriptors: *North Carolina, *Environmental effects, *Navigation, *Channel improvement, Coastal engineering, Commercial fishing, Recreation, Project purposes, Project benefits, Sand, Turbidity, Inlets (Waterways), Jetties, Dikes, Coasts, Beaches, Atlantic Ocean.
Identifiers: *Environmental impact statement, *Little River Inlet (NC), Coastal waters.

The project consists of channel improvement; dredging a deeper, more stable channel; and construction of jetties and sand transition dikes in order to improve navigability of the Little River Inlet along the North Carolina-South Carolina border opening to the Atlantic Ocean. Dredged material will be utilized in building the dikes and for nourishment of adjacent beaches. Difficulties with navigation at present stem from inadequate depths and rapid channel alignment shifts. Approximately 1,141,000 cubic yards of material will be dredged. The major environmental impact will be that of latering the hydrology of the Inlet to improve navigation, with benefits to commercial fishing and recreation boating. A minor adverse impact upon the marine life and fish habitat will take place as a result of turbidity from the dredging. The only alternatives considered were no project and dredging by itself, which proved uneconomical and physically unfeasible. Included are comments from interested agencies and a general map of the inlet and the project. (Brackins-Florida)
W72-13964

AQUATIC PLANT CONTROL PROGRAM, HUDSON AND MOHAWK RIVERS, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.

Available from the National Technical Information Service as PB-200 003-F, $3.00 in paper copy. August 2, 1971. 17 p.

Descriptors: *Spraying, *Hudson River, *Weed control, *Vegetation effects, Recreation, Velocity, *New York, Weeds, Application methods, Fish management, Mosquitoes, Nutrients, River flow, Aquatic environment, Administrative agencies, Vectors (Biological), Public health.
Identifiers: *Environmental impact statement, *Hudson and Mohawk Rivers (New York), *Waterchestnut.

The authorized project provides for work leading to the control and progressive eradication of waterchestnut in and from the waters within the Hudson and Mohawk Rivers by hand-pulling and hand and boat-spraying. The control of waterchestnut would increase recreation activity, maintain adequate water velocities for in-take systems, control mosquito and blackfly problems and increase fish production. As the dying waterchestnut plants start to deteriorate there is a nutrient release into the water, and tremendous duckweed blooms form. Usually the tide pulls the duckweed out of the bays into the open river, creating long green streaks that are quite noticeable. The only successful alternative to the use of boat or hand-sprayed 2,4-D is pulling the weeds by hand and removing them from the water. The program might have favorable biological effects by freeing fish passages and food sources for waterfowl. Other than material and labor costs there does not appear to be any irreversible or irretrievable commitment of resources over a period of time. (Waldron-Florida)
W72-13967

STUART GULCH DAM, IDAHO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Walla Walla, Wash.
For primary bibliographic entry see Field 08D.
W72-13968

DYNAMICS OF FLOOD FREQUENCY,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.

For primary bibliographic entry see Field 02E.
W72-14003

CALIFORNIA HIGH WATER, 1969-1970,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 02E.
W72-14013

HYDROLOGIC COMPUTATIONS AND FORECASTS (VOPROSY GIDROLOGICHESKIKH RASCHETOV I PROGNOZOV).

Gosudarstvennyy Gidrologicheskiy Institut, Trudy No 193, Leningrad, 1971. 136 p.

Descriptors: *Hydrology, *Hydrologic aspects, *Hydrologic data, *Forecasting, *Runoff forecasting, Discharge (Water), Floods, Reservoirs, Rivers, River basins, Deltas, Channels, Water levels, Water balance, Precipitation, intensity, Snow cover, Hydrographs, Correlation analysis, Regression analysis, Analytical techniques.
Identifiers: *USSR, *Neva River, Hydrometric stations.

This collection of 10 papers contains the results of investigations carried out in recent years by the Department of Hydrologic Forecasts of Leningrad State Hydrologic Institute. Hydrologic computations are described in connection with calculations of maximum water levels of the Neva River flowing from the southwest corner of Lake Ladoga into the Gulf of Finland. The accuracy of long-range forecasts of annual and spring-flood runoff is examined together with techniques for short-range forecasts of various items in the water balance. (Josefson-USGS)
W72-14038

DELAYED YIELD AND UNSATURATED FLOW ABOVE A FALLING WATER TABLE,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 02G.
W72-14052

UNSTEADY FLOW OF GROUND WATER,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 02F.
W72-14053

HYDROGEOLOGICAL STUDIES IN THE CAPTATION AREA OF THE LOISACH RIVER BETWEEN GARMISCH-PARTENKIRCHEN AND ESCHENLOHE/OBB,
Bayerische Akademie der Wissenschaften, Munich (West Germany).
For primary bibliographic entry see Field 02E.
W72-14148

STUDIES ON THE COURSE OF LITTER DECOMPOSITION IN A HUNGARIAN QUERCETUM-PETRAEAE-CERRIS FOREST STAND,
Eotvos Lorand Univ., Budapest (Hungary). Inst. for Systematic Zoology.
G. Gere.
Pedobiologia, 11 (5): 369-375, 1971.
Identifiers: Alder-D, Ash-D, Beech-D, *Decomposition, Forest litter, *Hungary, Oak-D, Quercetum-Petraea-Cerris.

A study is reported of litter decomposition in a forest near Budapest, Hungary. After the fall of leaves, the dropped material was weighed, then covered with wire netting, and weighed again at intervals. The weight of the material diminished by 20% in the 1st yr, and the remaining material lost 40% of its weight in the 2nd yr. At the end of the 3rd yr very little was left. The comparatively rapid litter decomposition under Hungarian conditions is attributed to the constant moisture content of the soil. Ordinarily oak and beech leaves decompose quite slowly, while alder and ash leaves rot rapidly.--Copyright 1972, Biological Abstracts, Inc.
W72-14165

4B. Groundwater Management

GROUND WATER IN KEARNY COUNTY, SOUTHWESTERN KANSAS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W72-13715

GEOHYDROLOGICAL INVESTIGATIONS WITH A VIEW TO GROUNDWATER CATCHMENT--A CASE HISTORY,
Rijksinstituut voor Drinkwatervoorziening, The Hague (Netherlands).
J. M. G. Van Damme.
Geologie en Mijnbouw (Netherlands), Vol 51, No 1, p 11-34, 1972. 24 fig, 4 tab, 15 ref.

Descriptors: *Hydrogeology, *Water yield, Drawdown, Water quality, Analog models, Mathematical models, Transmissivity, Glacial drift.
Identifiers: *Netherlands.

Geohydrological procedures for the establishment of a pumping station in the Netherlands, for the well field at Beerschoten (provincie of Utrecht, The Netherlands), are reviewed. The area concerned is located on the western slope of ice-pushed hills forming the Utrecht Ridge. The subsoil consists predominantly of Pleistocene sandy deposits of fluviatile origin, with local layers. The groundwater requires only a simple treatment. The transmissivity of the aquifer from which the water will be withdrawn amounts to 3500 sq m/day. On the basis of subsequent studies carried out by means of a mathematical method and electrical model tests, the consequences of the withdrawal for the groundwater table were predicted. The practical sustained yield in this area depends only on the drawdown due to the withdrawal and on the decrease of underground flow to drainage ditches. (Knapp-USGS)
W72-13723

FRESH WATER WINNING AND SALT WATER ENCROACHMENT IN THE AMSTERDAM DUNE WATER CATCHMENT AREA,
Amsterdam Water Works (Netherlands).
A. J. Roebert.
Geologie en Mijnbouw (Netherlands), Vol 51, No 1, p 35-44, 1972. 6 fig, 4 tab, 9 ref.

Descriptors: *Artificial recharge, *Water pollution control, *Withdrawal, *Saline water intrusion, *Hydrogeology, Water resources development, Water yield, Aquifer characteristics, Groundwater movement, Water supply, Path of pollutants.
Identifiers: Amsterdam (The Netherlands).

In the Amsterdam dune-water catchment area, a fresh-water lens of some 40 to 90 m thickness is resting on salt water in the lower aquifer. Water extraction from the lower aquifer has disturbed the fresh-water/salt-water interface, extending it into a zone of dispersed, brackish water. For many years, the extraction area has been overdrawn. With the introduction, in 1957, of artificial recharge through infiltration of Rhine water into the upper aquifer, water extraction from the lower aquifer with upconing of brackish water, was virtually stopped. The lower aquifer, however, still holds a vast stock of fresh water, which, if developed by a system of intermittent extraction, could substantially contribute to the water supply of the greater Amsterdam area. (Knapp-USGS)
W72-13724

THE USE OF GEOHYDROLOGY IN SOLVING WATER MANAGEMENT PROBLEMS IN AGRICULTURE,
Institute for Land and Water Management Research Wageningen (Netherlands).
J. Wesseling, and H. J. Colenbrander.
Geologie en Mijnbouw (Netherlands), Vol 51, No 1, p 71-84, 1972. 15 fig, 30 ref.

Descriptors: *Hydrogeology, *Water resources development, *Reviews, *Water management (Applied), Drainage engineering, Irrigation water, Agriculture, Agricultural watersheds.
Identifiers: *Netherlands.

For the study of water management problems in agriculture, often the same hydrologic parameters and calculation techniques are applicable as for civil engineering studies and water supply studies. Therefore, arbitrary subdivision of hydrology into agro-hydrology, geohydrology, and others does not always make sense. Groundwater flow in drained areas is determined to a large extent by hydrological conditions. For estimating net subsurface flow, two methods are discussed: the indirect method, in which transmissivity of the underlying aquifer and the vertical resistance of the covering layer are determined; and direct methods in which data on piezometric head or discharge data from pumping plants are used. In the higher parts of the Netherlands the hydrologic aspects are closely related to the conservation of water for agricultural purposes and the extraction of groundwater for domestic and industrial use. (Knapp-USGS)
W72-13726

RECENT DEVELOPMENTS OF PHYSICAL INVESTIGATIONS IN BOREHOLES AND WELLS,
Waterloopkundig Laboratorium, Delft (Netherlands).
F. Walter.
Geologie en Mijnbouw (Netherlands), Vol 51, No 1, p 121-130, 1972. 7 fig, 1 tab, 6 ref.

Descriptors: *Borehole geophysics, *Hydrogeology, *Reviews, Radioactive well logging, Electrical well logging, Subsurface investigations, Monitoring.
Identifiers: *Netherlands.

Well logging methods and physical borehole investigations have come into use for geohydrological reconnaissance in The Netherlands in recent years. In open uncased boreholes the following features are logged: spontaneous potential, resistivity, natural gamma radiation, and diameter. Interpretation methods are reviewed briefly. Reference is made to investigation methods in observation and discharging wells. Permanent electrode systems can be used for monitoring groundwater salinity. (Knapp-USGS)
W72-13727

TEST-OBSERVATION WELL NEAR DAVENPORT, WASHINGTON: DESCRIPTION AND PRELIMINARY RESULTS,
Geological Survey, Tacoma, Wash.
D. A. Myers.
Geological Survey Open-file Report, 1972. 23 p, 3 fig, 4 tab, 3 ref.

Descriptors: *Test wells, *Observation wells, *Aquifer characteristics, *Hydrologic data, *Washington, Pumping, Water yield, Specific capacity, Drawdown, Logging (Recording), Hydraulic gradient, Groundwater movement, Water levels, Water resources development, Irrigation.
Identifiers: *Davenport (Wash.).

The 750-foot test-observation well drilled near Davenport, Wash., provides information on aquifer characteristics in the area. The well was drilled by air-rotary methods and penetrates eight aquifer zones (A through H); the upper 75 feet of

the well is cased, and the remainder of the hole is open in basalt. Test pumping during drilling showed that the well had specific capacities of (1) 4.8 gpm per foot of drawdown when at the 255-foot depth and open to aquifers A through D, (2) 5.6 gpm per foot of drawdown when at the 640-foot depth and open to aquifers A through G, and (3) 76.5 gpm per foot of drawdown when at the full 750-foot depth and open to all eight aquifers. Most of the water available to the well is from the deepest aquifer (zone H). Borehole geophysical logging supplemented the driller's log of the well and provided information on natural gamma radiation, water temperature and resistivity, and borehole diameter. In the completed well each aquifer is isolated by cement seals, and piezometer pipes installed to zones B through H allow a basis for defining the vertical hydraulic gradient, groundwater movement and chemical quality in the area. (Woodard-USGS)
W72-13733

ELECTRIC ANALOG STUDIES OF FLOW TO WELLS IN THE PUNJAB AQUIFER OF WEST PAKISTAN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W72-13735

ENVIRONMENTAL GEOLOGY AND HYDROLOGY, TALLAHASSEE AREA, FLORIDA.
Florida Dept. of Natural Resources, Tallahassee. Bureau of Geology.
For primary bibliographic entry see Field 06D.
W72-13740

ECONOMIC EFFICIENCY IN THE ALLOCATION OF IRRIGATION WATER OVER TIME,
Oklahoma Water Resources Research Inst., Stillwater.
For primary bibliographic entry see Field 06B.
W72-13823

NONSTEADY FLOW IN A RECHARGE WELL--UNCONFINED AQUIFER SYSTEM,
California Univ., Los Angeles.
For primary bibliographic entry see Field 02F.
W72-13828

GENERAL GROUND-WATER QUALITY IN FRESH-WATER AQUIFERS OF DELAWARE,
Delaware Geological Survey, Newark.
For primary bibliographic entry see Field 05B.
W72-13832

GEOLOGY AND GROUND WATER, UNIVERSITY OF DELAWARE, NEWARK, DELAWARE,
Delaware Geological Survey, Newark.
K. D. Woodruff, J. C. Miller, R. R. Jordan, N. Spoljaric, and T. E. Pickett.
Report of Investigations No 18, May 1972. 40 p, 11 fig, 2 tab, 17 ref.

Descriptors: *Groundwater resources, *Hycrogeology, *Aquifers, *Water wells, *Delaware, Geology, Aquifer characteristics, Water yield, Water quality, Chemical analysis, Water resources development, Water levels, Pumping, Drawdown, Transmissivity, Specific capacity, Hydrologic data.

The results of an intensive groundwater study on University of Delaware lands in the Newark area revealed additional sources of available groundwater. Geophysical techniques, air-photo interpretation, studies of existing data, field mapping, test drilling, and pump tests were used as the bases for guiding additional well development. The study, conducted by the Delaware Geological Survey, was a cooperative effort between the University of Delaware and the City of Newark in response to mutual water supply problems. A potential groundwater yield of about 500 gpm (gallons per minute) was discovered on the University Laird Tract in the Piedmont Province. Groundwater available from other locations in the Coastal Plain portion of the study area may total about 175 gpm. However, careful well development and proper well spacing will be necessary to obtain optimum yields. (See also W72-13832 and W72-13834) (Woodard-USGS)
W72-13833

NITRATE CONTAMINATION OF THE WATER--TABLE AQUIFER IN DELAWARE,
Delaware Geological Survey, Newark.
For primary bibliographic entry see Field 05B.
W72-13834

GROUND-WATER GEOLOGY OF THE DELAWARE ATLANTIC SEASHORE,
Delaware Geological Survey, Newark.
For primary bibliographic entry see Field 02F.
W72-13835

GROUND-WATER OUTFLOW FROM CHINO BASIN, UPPER SANTA ANA VALLEY, SOUTHERN CALIFORNIA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W72-13838

EXPERIMENTAL INJECTION OF TERTIARY--TREATED SEWAGE IN A DEEP WELL AT BAY PARK, LONG ISLAND, N. Y.--A SUMMARY OF EARLY RESULTS,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 05B.
W72-13839

SEA WATER INTRUSION: MORRO BAY AREA, SAN LUIS OBISPO COUNTY,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 02L.
W72-13846

GROUND-WATER OCCURRENCE IN THE MARYLAND PIEDMONT,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 02F.
W72-13848

WATER LAW--GROUNDWATER RIGHTS IN MISSOURI--A NEED FOR CLARIFICATION (HIGDAY V. NICKOLAUS),
For primary bibliographic entry see Field 06E.
W72-13939

U234/U238 DISEQUILIBRIUM IN GROUNDWATERS OF CENTRAL TEXAS,
Rice Univ., Houston, Tex. Dept. of Geology.
For primary bibliographic entry see Field 05B.
W72-13971

AN INTEGRATION OF THE AGRICULTURAL DEMAND FUNCTION FOR WATER AND THE HYDROLOGIC MODEL OF THE PECOS BASIN,
New Mexico State Univ., University Park. Water Resources Research Inst.
For primary bibliographic entry see Field 06D.
W72-13993

GROUNDWATER RESOURCES OF SALINE COUNTY, MISSOURI,
Geological Survey, Rolla, Mo. Water Resources Div.
For primary bibliographic entry see Field 02F.
W72-14011

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1972,
Geological Survey, Salt Lake City, Utah.
C. T. Sumsion.
Utah Division of Water Resources Cooperative Investigations Report No 10, 1972. 73 p, 37 fig, 2 tab, 8 ref.

Descriptors: *Groundwater resources, *Hydrologic data, *Basic data collections, *Utah, Aquifer characteristics, Water wells, Water utilization, Water supply, Water yield, Withdrawal, Groundwater recharge, Water table, Water level fluctuations, Water quality, Precipitation (Atmospheric), Hydrogeology.

The estimated withdrawal of water from wells in Utah in 1971 was 710,000 acre-feet, or about 30,000 acre-feet more than for 1970. In 1971, precipitation was above normal in 6 of the State's 7 divisions. Precipitation in the north-central division was 3.85 inches above normal and 0.29 inch above normal in the south-central division; these two divisions include most of the major areas of groundwater development in the State. The southeast division suffered a deficiency of 0.30 inch during 1971. From February-March 1971 to February-March 1972, groundwater levels generally declined in southwestern Utah because more groundwater was withdrawn for irrigation, and rose in northern Utah where more surface water was available for irrigation. Conditions in the central part of the State were variable, and no consistent pattern of water-level change is evident. Groundwater development and changes in groundwater conditions in the major areas of groundwater development are summarized. (Woodard-USGS)
W72-14023

RECORDS OF WELLS IN HARRIS COUNTY, TEXAS, 1892-1972,
Geological Survey, Austin, Tex.
R. K. Gabrysch, W. L. Naftel, G. D. McAdoo, and C. W. Bonnet.
Geological Survey Open-file Report (Texas District), 1972. 170 p, 11 fig, 7 ref.

Descriptors: *Well data, *Groundwater resources, *Basic data collections, *Logging (Recording), *Texas, Surveys, Aquifers, Water levels, Water utilization.
Identifiers: *Harris County (Tex), *Well inventory.

Records are presented for 2,635 wells in Harris County, Texas, as part of the well inventory from 1929 to 1972. In addition to the tables of well data, maps are included which show the location and water use for each well. (Woodard-USGS)
W72-14027

USE OF WATER IN ARKANSAS, 1970,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 06D.
W72-14028

DEVELOPMENT OF GROUND WATER IN THE EL PASO DISTRICT, TEXAS, 1963-70,
Geological Survey, El Paso, Tex.
For primary bibliographic entry see Field 02F.
W72-14029

POTENTIALS FOR DESALTING WATER IN THE TULAROSA BASIN, NEW MEXICO - A CASE STUDY,
New Mexico State Univ., University Park. Water Resources Research Inst.
For primary bibliographic entry see Field 03A.
W72-14059

EFFECT OF PUMPING FRESHWATERS INTO OIL STRATA OF THE PERM PRIKAMJE ON THE DISTRIBUTION OF MICROFLORA, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Mikrobiologii.
For primary bibliographic entry see Field 05C.
W72-14135

CROPPING PATTERN IN RELATION TO WELL IRRIGATION,
Ranchi Univ. (India).
For primary bibliographic entry see Field 03F.
W72-14150

4C. Effects on Water of Man's Non-Water Activities

EFFECTS OF LAND USE ON MUNICIPAL WATERSHEDS,
North Carolina Water Resources Research Inst., Raleigh.
T. E. Maki, and W. L. Hafley.
Available from the National Technical Information Service as PB-211 862, $3.00 in paper copy, $0.95 in microfiche. North Carolina Water Resources Research Institute, Raleigh, Report No 71, July 1972, (UNC-WRRI-72-71). 224 p, 66 fig, 15 tab, 60 ref. OWRR B-010-NC (3).

Descriptors: *Land use, *Watershed management, *Water yield, *Water quality, *Water supply, Small watersheds, Water conservation, Water pollution sources, *North Carolina.
Identifiers: *Durham, *North Carolina, *Lake Michie watershed (NC), Durham (NC).

A study of the Lake Michie Watershed, the source of water for the municipality of Durham, North Carolina, is reported. The study was concerned with evaluating the effects of land use on water quality, quantity, and timing of flow during the 43-year period since the establishment of the lake. The characteristic composition of the soils and the vegetative cover and their influence on the hydrology of the basin are discussed. Through the interpretation of aerial photographs, Agricultural Census Data and other historic documents, the nature of land use changes within the watershed have been traced. An interpretation of the influence of these land use changes is offered. Current status of the watershed is detailed and recommendations presented for improving the quality of the water and the general hydrologic characteristics of the watershed. The study highlights the problems encountered by a Water Resources Department that must manage water availability on a watershed where it is not the major land owner.
W72-13759

PROCEDURES FOR ESTIMATING THE HYDROLOGIC IMPACT OF URBANIZATION,
Regional Science Research Inst., Philadelphia, Pa.
T. R. Hammer.
Regional Science Research Institute Contract Report to OWRR, September 1971. 33 p, 3 fig. OWRR Contract C-2174 (3406) (1).

Descriptors: *Rainfall-runoff relationships, *Urban hydrology, *Urbanization, *Storm runoff, Storm drains, Infiltration, Urban runoff, Storm water, Urban drainage, Suburban areas, *Pennsylvania.
Identifiers: *Philadelphia (Penn).

The results of a recent study of the hydrologic impact of urbanization are stated in a form that may be readily applied to planning situations or to the estimation of current effects of urbanization. Conversion of land to impervious surface increases storm runoff by preventing infiltration of rainwater into the soil and by eliminating surface depressions which would provide storage; consequently, the peak streamflow accompanying a storm of a given magnitude is increased. This process is assisted by the drainage alterations which typically accompany urbanization, such as the provision of storm sewerage, which speed runoff to the stream and thus prevent its infiltration or detention in some area other than the source area. Stream channel cross-section area appears to increase, in response to urbanization, in the same proportion as the increase in the average annual flood. This is the flood flow which is equalled or exceeded every 2.33 years on the average. An impervious area index is employed along with a basin slope factor to estimate channel enlargement and peak flow increase. The index may be estimated on the basis of limited information which is likely to be available. The two types of information considered here are: (1) the information contained in U.S. Geological Survey 7 1/2 inch quadrangle maps, and (2) the number of persons per square mile in the watershed in question. (Knapp-USGS)
W72-14002

4D. Watershed Protection

SEEDBED PREPARATION AND SEEDING METHODS TO ESTABLISH GRASSED WATERWAYS,
Agricultural Research Service, Sidney, Mont.
For primary bibliographic entry see Field 04A.
W72-13914

WINNEBAGO-BEAN CREEK WATERSHED, RICHARDSON COUNTY, NEBRASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as PB-201 254-D, $3.00 in paper copy. June 1971. 12 p.

Descriptors: *Nebraska, *Environmental effects, *Stabilization, *Watershed management, Erosion control, Sedimentation, Multiple-purpose projects, Gully erosion, Detention reservoirs, Sediment control, Dams, Spillways, Administrative agencies, Decision making, Project planning, Wildlife habitats, Waterfowl, Recreation, Flooding, Flood protection, Flood control.
Identifiers: *Environmental impact statement, *Winnebago-Bean Creek Watershed (Neb).

The project, located in Richardson County, Nebraska, involves conservation land treatment within the watershed supplemented by 16 grade stabilization structures. The project will have the following environmental impacts: reduce erosion and sediment delivery to the Missouri River from this watershed, reduce gully development in 16 problem areas, protect 1,620 acres from depreciation or destruction by gully development, reduce damages to roads and bridges, and create about 74 acres of water surface that can be used for fishing and other water-based recreation activities, and as a feeding and resting place for migratory waterfowl. Adverse impacts include: elimination of agricultural use and wildlife habitat on 74 acres in the sediment pools, elimination of agricultural and wildlife use in the 19 acres of construction areas until the areas are revegetated after construction, and inundation of about 6 miles of intermittent streams. Alternatives considered include conservation land treatment alone, converting all cropland in the 16 problem areas to grass, and several combinations of different types of structural measures. Irreversible and irretrievable commitments of resources include the land for the sediment pools, dams and spillways, and detention pools and approximately 6 miles of intermittent stream channels inundated by the planned sediment pools. (Widman-Florida)
W72-13951

WINNEBAGO-BEAN CREEK WATERSHED, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as PB-201 254-F, $3.00 in paper copy. November 1971. 33 p, 3 map, 2 tab.

Descriptors: *Nebraska, *Soil conservation, *Stabilization, *Environmental effects, Missouri River, Watershed management, Erosion control, Water conservation, Structures, Sediment yield, Land development, Water conservation, Structures, Wildlife habitats, Non-structural alternatives, Administrative agencies, Crop production, Sedimentation.
Identifiers: *Environmental impact statement, *Winnebago-Bean Creek Watershed (Neb).

The project involves conservation land treatment within the Winnebago-Bean Creek watershed supplemented by 16 grade stabilization structures. The project will reduce erosion and sediment delivery to the Missouri River from this watershed, protect 2,570 acres by gully development, reduce damages to roads and bridges, and create about 74 acres of water surface that can be used for fishing and other water-based recreation activities, and as a feeding and resting place for migratory waterfowl. There will be a 50 percent reduction in the amount of sediment delivered to the Missouri River from this watershed. The project will have the following adverse impacts: eliminate agricultural use and wildlife habitat on 74 acres of cropland, woodland and pasture used in the sediment pools; eliminate agricultural and wildlife use on 19 acres used for spillways and dams; innundation of 90 acres in the detention pools; and innundation of six miles of intermittent streams. Alternatives considered include: conservation land treatment alone, converting all cropland in the 16 problem areas to grass, and several combinations of different types of structural measures. (Waldron-Florida)
W72-13966

THEORY OF STOCHASTIC MODELING OF WATERSHED SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-14007

EROSION CONTROL PRACTICES IN PRIMARY CULTIVATION OF SOIL ON SLOPES OF THE CARPATHIANS, (IN RUSSIAN),
Y. H. Khudyk.
Visn Sil'S'Kohospod Nauk. 7. 47-50. 1970.
Identifiers: Arable land, Carpathians, *Erosion control, *Cultivation, Ridging, *Slopes, Soils, USSR.

Deepening of the arable layer on the slopes with subsoilers reduced erosion by 26.4-37.2%, while subsoiling together with ridging reduced it by 39-48.2% in comparison with ordinary winter plowing across the slope. Leaving the stubble without plowing until spring resulted in soil erosion of 11 m3/ha during autumn-spring on steep, heavily eroded slopes and water divides.--Copyright 1972, Biological Abstracts, Inc.
W72-14170

EROSION-AMELIORATIVE INVESTIGATIONS OF SOILS IN KAZAKHSTAN, (IN RUSSIAN),
R. Dzhanpeisov.
Tr Inst Pochvoved Akad Nauk Kaz SSR. 19: 3-23. 1970.
Identifiers: Aggregates, Amelioration, Chemicals, Colloids, *Erosion control, *Kazakhstan, *Soils, USSR.

Water and wind erosion of soils is regional-zonal. The type of soil erosion is controlled by relief-forming processes, the colloid-chemical composi-

tion of soil aggregates and man's economic activity. With respect to the aggregate-formation type, soils on the medium high mountains of southern and southeastern Kazakhstan are ferruginous-argillaceous-fulvate-humate; soils on piedmont plains and northern steppes are loose humate, and soils in desert areas are loose calcareous-argillaceous. Their resistance to erosion declines accordingly.--Copyright 1972, Biological Abstracts, Inc.
W72-14174

05. WATER QUALITY MANAGEMENT AND PROTECTION

A LITERATURE SEARCH AND CRITICAL ANALYSIS OF BIOLOGICAL TRICKLING FILTER STUDIES - VOL II.
Dow Chemical Co., Midland, Mich. Functional Products and Systems.

Copy available from GPO Sup Doc EP2.10:17050 DDY 12/71 $2.75; microfiche from NTIS as PB-211 910, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, December 1971, 361 p. EPA Program 17050 DDY 12/71.

Descriptors: *Biological treatment, *Trickling filters, *Bibliographies, Filters, Waste water treatment, Filtration, Reviews, Aerobic treatment, Treatment facilities, Industrial wastes, Municipal wastes.

A bibliography of 5,665 references relating to biological trickling filters studies was presented. Author references were listed in alphabetical sequence based upon the surname of the author. Anonymous articles were listed after the alphabetical author sequence, according to the alphabetical sequence of the journal, and chronologically within the journal. (See also W72-13638) (Galwardi-Texas)
W72-13639

5A. Identification of Pollutants

SIZE DISTRIBUTION OF BACTERIAL CELLS,
Science Spectrum, Inc., Santa Barbara, Calif.
V. R. Stull.
Journal of Bacteriology, Vol 109, No 3, p 1301-1303, March 1972. 4 fig, 4 ref.

Descriptors: *Bacteria, *Distribution, *Measurement, *Methodology, *Size, Instrumentation, Sampling, Laboratory equipment, Cultures, Microscopy, Photometry.
Identifiers: *Differential light scattering, Lasers, Staphylococcus epidermidis.

In a current research program to develop a basis for rapid identification of bacteria via differential light-scattering measurements, an empirical method for determining cell size and size distribution has been derived. The measurements are made with a laser light-scattering photometer which scans and records the differential light-scattering pattern of a single bacterium held fixed within the laser beam. The instrument uses an Argon-ion laser, tuned to a wavelength of 0.5145 micron. The cells are injected pneumatically from a nebulizer into the scattering chamber where they are viewed through a low-power microscope. The individual bacteria are brought into the laser beam by manual adjustment of the electric fields between the plate and point electrodes and then held in position by an automatic servomechanism. A detector system employing photomultiplier is rotated by motor-drive about the suspended particle and the light-scattering pattern is recorded graphically. Sample preparation involves (1) culturing the microbes on fresh culture media for a known period of time and at a known temperature; (2) incubating cultured cells; (3) washing with cold distilled water; and (4) storing cell suspensions at 0 degree C in distilled water until samples are transferred to the nebulizer. (Long-Battelle)
W72-13667

AN AUTOMATED LIQUID CHROMATOGRAPHIC METHOD FOR THE DETERMINATION OF TETRACYCLINE ANTIBIOTICS,
American Cyanamid Co., Pearl River, N.Y. Lederle Labs.
P. P. Ascione, J. B. Zagar, and G. P. Chrekian.
Journal of Chromatography, Vol 65, No 2, p 377-386, February 23, 1972. 6 fig, 4 tab, 19 ref.

Descriptors: *Automation, *Separation techniques, *Pollutant identification, Antibiotics (Pesticides), Organic pesticides, Instrumentation, Laboratory equipment, Flow rates, Spectrophotometry, Methodology, Solvent extractions, Statistical methods, Chemical analysis.
Identifiers: *Liquid chromatography, *Tetracycline antibiotics, Column chromatography, Chlortetracycline HCl, Tetracycline HCl, Demethylchlortetracycline HCl, Precision, Accuracy, Sample preparation, Absorbance.

A liquid chromatographic method for the determination of tetracycline antibiotics has been automated. A valve arrangement is used through which 20-30 samples are applied sequentially at a flow rate of 5 ml/min on a single column for chromatographic analysis. The components eluted from the column are automatically analyzed (12 samples/hr) by monitoring the column eluate with calcium Lactate-morpholine (CIM) through a spectrophotometric flow cell of a spectrophotometer. For the tetracyclines studied, the wavelengths where maximum absorption occured when the CIM reagent was introduced into the tetracycline-chromaphoric system were as follows: demethylchlortetracycline, 390 nm; tetracycline, 385 nm; chlortetracycline, 393 nm. A statistical study for precision and accuracy was made using 24 replicates and quadruplicate assays, respectively. The overall precision had a coefficient of variation of 1.01 with a standard error estimated to be 0.144. This method is applicable to crystalline tetracycline antibiotics and their various pharmaceutical dosage forms. (Long-Battelle)
W72-13669

A MODIFIED PLASTIC BAG COMBUSTION TECHNIQUE FOR THE RADIOASSAY OF C-14 AND H-3 IN BIOLOGICAL TISSUES,
Huntingdon Research Centre (England). Dept. of Metabolic Studies and Organic Synthesis.
J. D. Lewis.
International Journal of Applied Radiation and Isotopes, Vol. 23, No. 1, p 39-40, January 1972. 1 fig, 5 ref.

Descriptors: *Radiochemical analysis, *Tritium, Carbon radioisotopes, Laboratory equipment, Oxygen, Methodology, Freeze drying, Chemicals, Pesticides, Bioassay, Chemical analysis, Chemical reactions, Radioactivity techniques.
Identifiers: *Biological samples, *Combustion techniques, *C-14, Hexadecane, Scintillation counting, Sample preparation, Tissue, Blood, Precision, H-3.

The modified plastic bag combustion technique for the radioassay of Carbon-14 and tritium in biological tissues is applicable to large and small freeze-dried samples. The advantages for using a plastic bag combustion chamber instead of a flask include: (1) disposability of the plastic bags; (2) ease in decontamination of the apparatus; and (3) elimination of the explosion hazard. Samples are placed in a polythene-nylon bag and ignition is accomplished with a projector lamp bulb. When combustion is complete, 10.0 ml of liquid scintillation fluid is injected into the bag and allowed to equilibrate for 30 minutes. A five-ml aliquot is then removed for counting. The combusion of labelled n-hexadecane added to tissue or blood yielded overall recoveries of 90-92 percent tritium and 98-99 percent for C-14. Similar results have been obtained for a wider range of labelled drugs, pesticides, and industrial chemicals. (Long-Battelle)
W72-13670

EVALUATION OF METHODS FOR DETECTION OF COLIFORM BACTERIA IN RAW MILK,
Arizona Univ., Tucson. Dept. of Dairy and Food Sciences.
J. A. Moura Fe, and F. E. Nelson.
Journal of Milk and Food Technology, Vol. 35, No. 2, p 67-70, February 1972. 4 fig, 2 tab, 19 ref.

Descriptors: *Methodology, *Coliforms, *Evaluation, *Milk, Cultures, E. coli, Sampling, Water pollution sources, Pollutant identification, Enteric bacteria.
Identifiers: Aerobacter aerogenes, Escherichia freundii, Most probable number test, Biochemical tests, Culture media, Violet Red Bile agar, Lauryl Sulfate Tryptose broth.

Various methods have been used for detecting coliforms in mild and food. Milk samples were taken from farm bulk tanks in both summer and winter. Total coliform populations were estimated by counting cells grown on Violet Red Bile agar (VRB) at 32 degrees C and on Lauryl Sulfate Tryptose Broth (LST) incubated at 37 degrees C. LST favored recovery of Aerobacter aerogenes, the IMViC-irregular types, and the majority of bacteria which produced ropiness. Escherichia coli, incubated at 44.5 C on EC medium, showed no constant relationship to total coliform numbers and was the most numerous organism detected. Plates of VRB and 5-5ube serial dilutions of LST broth gave similar total coliform estimates in milk. (Long-Battelle)
W72-13671

CHARACTERIZATION OF GAS CHROMATOGRAPHIC EFFLUENTS VIA SCANNING FLUORESCENCE SPECTROMETRY,
Harvard Univ., Cambridge, Mass. Coolidge Chemical Lab.
D. J. Freed, and L. R. Faulkner.
Analytical Chemistry, Vol. 44, No. 7, p 1194-1198, June 1972. 4 fig, 1 tab, 17 ref.

Descriptors: *Gas chromatography, *Effluents, Fluorescence, Instrumentation, Laboratory equipment, Fluorometry, Sampling, Aromatic compounds, Pollutant identification.
Identifiers: *Characterization, *Scanning fluorescence spectrometry, Anthracene, Pyrene, Naphthalene, Chemical interference, Phenanthrene, Aromatic hydrocarbons.

A simple technique for the detection and identification of gas chromatographic effluents involves the direct coupling of a gas chromatograph to a fast-scanning fluorescence spectrometer. Samples of the aromatic hydrocarbons naphthalene, phenanthrene, anthracene, and pyrene were analyzed by this technique. A 200-800 nm spectral range was continuously scanned at 5-sec intervals at 150 nm/sec in order to prevent distortions as a result of changing effluent concentrations. Typical detection limits were 0.1 picogram/sec for anthracene, 5 picograms/sec for pyrene, and 0.2 picogram/sec for phenanthrene. Fluorescence emission and excitation spectra which are sufficiently structured for use in identification have been obtained with as little as 10 ng of sample. Qualitative and quantitative aspects are compared to other detectors and the vast simplification that wavelength discrimination affords to complex chromatographs is illustrated. (Long-Battelle)
W72-13672

A QUANTITATIVE COMPARISON OF PIGMENT EXTRACTION BY MEMBRANE AND GLASS-FIBER FILTERS,
Kent State Univ., Ohio. Dept. of Biological Sciences.
E. B. Long, and G. D. Cooke.
Limnology and Oceanography, Vol. 16, No. 6, p 990-992, November 1971. 1 fig, 1 tab, 3 ref.

Descriptors: *Phytoplankton, *Chlorophyll, *Evaluation, *Separation techniques, Spectrophotometry, Lakes, Plant pigments, Detritus, Chlorophyta, Chrysophyta, Solvent extractions, Diatoms, Aquatic algae, Filtration, Cyanophyta, *Eutrophication, *Ohio.
Identifiers: *Glass fiber filters, *Membrane filters, Grange Lake, East Twin Lake, Lake Rockwell, Lake Hodgson, Clearwater Quarry, Dollar Lake, Chlorophyll a, Absorbance.

Water samples collected from six eutrophic northeastern Ohio lakes were used in a study concerned with a quanitative comparison of pigment extraction by membrane and glass-fiber filters. The phytoplankton-containing water samples were measured into 500-ml subsamples and filtered at 0.25-0.33 atm. The filter types tested were 47-mm-diameter type HA Millipore membrane filters (0.45 micron pore size; cellulose acetate) and 42.5-mm-diameter types GF/C and GF/A Whatman glass-fiber filters. The phytoplankton was extracted into acetone and absorbances measured spectrophotometrically at 665 millimicrons. Data were analyzed by 'Student's' t statistic. Absorbances of the acetone extracts from lake phytoplankton collected on glass-fiber filters, ground and extracted 2 hr, were 6-18 percent greater tahn from phytoplankton collected on membrane filters and processed identically. Use of the glass-fiber filters cut filtering time by a factor of 10 and material cost by a factor of 4 or more. (Snyder-Battelle)
W72-13673

SAMPLING AND SPATIAL DISTRIBUTION OF BENTHONIC FORAMINIFERA,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
C. T. Schafer.
Limnology and Oceanography, Vol. 16, No. 6, p 944-951, November 1971. 5 fig, 1 tab, 33 ref.

Descriptors: *Protozoa, *Spatial distribution, *Sampling, Sediments, Distribution patterns, Cores, Bioindicators, Scuba diving, Benthic fauna.
Identifiers: *Foraminifera, *Gulf of St. Lawrence.

Foraminifera were collected from bottom sediments in the Gulf of St. Lawrence in order to determine spatial distribution data to provide sampling guidelines for future ecological studies. Seventeen sampling stations were used with up to six replicate cores taken at each by Scuba divers using plastic coring tubes. Results indicate that the size, spacing, and number of replicate sediment samples collected do not always adequately represent the living population. In these samples, there was a pronounced patchy geographic distribution in waters less than 24 m deep. Species proportions were most variable in waters less than 20 m deep. A significant number of living specimens was encountered to a depth of 9 cm in the bottom sediments. (Mortland-Battelle)
W72-13674

WAX-BOUND LEAD DIOXIDE POTENTIOMETRIC ELECTRODE AND APPLICATIONS TO CHELOMETRIC TITRATION,
Wisconsin Univ., Milwaukee. Dept. of Chemistry, and Wisconsin Univ., Milwaukee. Lab. for Surface Studies.
C. N. Wang, P. J. Kinlen, D. A. Schoeller, and C. O. Huber.
Analytical Chemistry, Vol. 44, No. 7, p 1152-1158, June 1972. 10 fig, 4 tab, 17 ref.

Descriptors: *Volumetric analysis, *Measurement, *Heavy metals, Anions, Potentiometers, Hydrogen ion concentration, Ions, Laboratory equipment, Zinc, Copper, Nickel, Manganese, Cadmium, Iron, Chromium, Aluminum, Lead, Separation techniques.
Identifiers: *Lead dioxide electrode, *Chelometric titration, Chemical interference, Precision.

The effects of pH, buffer, metal ion, and chelon on the shapes of potentiometric titration curves obtained with a wax-bound lead dioxide electrode were evaluated. Mechanisms of response are proposed and accuracy and precision for several well established titrations are presented. The electrode consists of powdered lead dioxide imbedded in high-melting paraffin wax. Electrical contact in the body of the electrode is by particle-to-particle contact. The electrode face contains discrete surface equilibrium reaction sites at which a stable potential is maintained. Titration data are presented for a number of metals including Al, Cr, Cd, Cu, Fe, Pb, and Zn. These data indicate that most metals ordinarily titrated with EDTA can be determined and the titration curves are not affected by the particular metal being titrated. The titration curves obtained for these metals must be interpreted in terms of a pH effect observed when decreased buffer concentrations result in an increase in potential from initiation to the end point. At pH 5, a sharp peaked shape maximum marks the end point, while at pH 10 with suitable procedure a peak shape minimum occurs at the end point. Precision and accuracy of titration approach 0.1 percent and are characteristic of the volumetric apparatus used. Titrations may be performed in forward and reverse directions. By proper selection of solution buffer concentration, titrations of less than 100 micrograms of metals yield a very distinct end-point signal. Measured solubilities show that electrode dissolution interferes only slightly for the lowest concentrations titrated. Most common anions do not interfere. (Long-Battelle)
W72-13676

DETERMINATION OF DIETHYLSTILBESTROL IN CATTLE TISSUES,
Lilly (Eli) and Co., Greenfield, Ind. Greenfield Labs.
A. L. Donoho, W. S. Johnson, and W. L. Sullivan.
Eli Lilly and Company, Procedure 5801611, January 1972. 9 p.

Descriptors: *Pollutant identification, *Gas chromatography, *Bioassay, *Cattle, Separation techniques, Hydrolysis, Solvent extractions, Methodology, Chemical analysis.
Identifiers: *Diethylstilbestrol, *Tissue, Glucuronide, Electron capture detector, Muscle, Liver, Kidneys, Biological samples, Hormones, Adipose tissue, Sample preparation.

An assay technique is described for diethylstilbestrol (DES) in cattle tissues (muscle, liver, kidney, and fat). DES and its glucuronide are extracted from the tissue with methanol and the samples are subjected to beta-glucuronidase enzymatic hydrolysis to yield free DES. Free DES is extracted from fat with chloroform. The samples are purified by liquid-liquid extraction. The DES is reacted in base with dichloracetyl chloride to form the ester which is measured by gas chromatography using electron capture detection. When carefully applied, the procedure will detect DES levels of 0.5 ppb or lower in liver samples. Quantitation is reasonably good in the 0.002 to 0.001 ppm range. Below 0.002 ppm, the procedure is only semiquantitative. (Mortland-Battelle)
W72-13677

DETECTION AND MEASUREMENT OF TRITIUM BY BREMSSTRAHLUNG COUNTING,
Mound Lab., Miamisburg, Ohio.
M. L. Curtis.
International Journal of Applied Radiation and Isotopes, Vol. 23, No. 1, p 17-23, January 1972. 7 fig, 6 ref.

Descriptors: *Tritium, *Radiochemical analysis, *Radioactivity techniques, *Pollutant identification, Aqueous solutions, Testing procedures, Measurement, Sampling, Water pollution, Water pollution sources.
Identifiers: *Bremsstrahlung counting, Scintillation counting, H-3, Detection limits, Liquid scintillation.

A method of analysis is described for the detection and measurement of tritium by Bremsstrahlung counting where beta radiation from tritium cannot be readily detected. The procedure involved placing liquid or solid samples into shallow polyethylene bags and measuring the radiation using sodium iodide crystals with thin aluminum or beryllium windows and a multichannel analyzer. Tritium disintegration rates were determined by comparison with the Bremsstrahlung counting rate of a tritiated standard and by adjusting disintegration values to sample composition. The method has been used in studies of tritium adsorbed on charcoal, tritium in contaminated and discolored pump oil, and in aqueous waste materials. It is applicable to analysis for tritium in any material in the concentration range of one microcurie/cc or higher, which can be contained in polyethylene provided a comparable standard can be prepared. (Long-Battelle)
W72-13679

EFFECT OF PH ON THE FILTRATION OF AQUATIC HUMUS USING GELS AND MEMBRANES,
Norsk Institutt for Vannforskning, Oslo.
E. T. Gjessing.
Schweizerische Zeitschrift fur Hydrologie, Vol. 33, No. 3, p 592-600, December 31, 1971. 6 fig, 2 tab, 14 ref.

Descriptors: *Hydrogen ion concentration, *Humus, *Freshwater, Organic matter, Adsorption, Organic compounds, Water pollution sources, Color, Laboratory equipment, Indicators, Separation techniques, Anion exchange, Adsorption, Distillation, Sieves, Sampling.
Identifiers: *Membrane dialysis, *Gel filtration, Membrane filtration, UV absorptiometer.

Gel filtration and membrane dialysis experiments were conducted on concentrated freshwater samples to determine the effects of pH levels and ionic strength on the composition of aquatic humus. Both indicated that the molecular size of humus increased with pH, and apparently ionic strength had little to do with the observed change in size. An increase in color was also noted with a rise in pH and was attributed to the change in molecular size of the humus. Membrane dialysis of acidic, alkaline, and 'natural' samples confirmed this change of molecular size by pH. However, other investigators attributed these changes to other parameters such as a decrease in the extent of adsorption on gel due to rising pH. Finally, aggregation and condensation of humus were proposed as mechanisms for the changes observed. (Long-Battelle)
W72-13681

DEVELOPMENT OF LACTIC ACID BACTERIA DURING EARLY STAGES OF FERMENTATION IN FISH SILAGE,
Lantbrukhogskolan, Uppsala (Sweden). Dept. of Microbiology.
S. Wirahadikusumah, O. Rajala, S. Lindgren, and R. Nilsson.
Archiv fur Mikrobiologie, Vol. 82, No. 2, p 95-100, February 28, 1972. 1 fig, 1 tab, 15 ref.

Descriptors: *Fish, *Fermentation, *Pollutant identification, *Silage, Streptoccus, Aerobic bac-

teria, Lactobacillus, Methodology, Isolation, Cultures, Hydrogen ion concentration, Growth rates.
Identifiers: *Lactic acid bacteria, Streptococcus faecalis, Lactobacillus plantarum, Biochemical tests, Streptococcus lactis, Streptococcus cremoris, Lactobacillus casei, Lactobacillus buchneri, Lactobacillus brevis, Lactobacillus cellobiosus, Lactobacillus fermenti, Enterococcus, Veridans, Streptobacterium, Thermobacterium, Leuconostoc mesenteroides.

The lactic acid bacteria which develop during the early stages of fermentation in fish silage have been identified. Fish silage was prepared by mixing minced uneviscerated fish with malt and cereal meals. Dilutions of silage (1: 100,000,000) were inoculated onto agar plates and incubated at 28 degrees C for 5 days. Single colonies were removed from these plates and inoculated into MRS broth and incubated for 3 days at 28 degrees C. Isolates were classified morphologically into 3 groups including rods (Lactobacillus), round cocci, and oval cocci (Streptococcus and Leuconostoc). They were subclassified according to their ability to produce ammonia from arginine when grown at 45 C or 15 C. The first type of organisms that grew fastest was the oval cocci followed by round cocci (mostly S. faecalis). The number of oval cocci increased rapidly one day after ensiling and then decreased after 2-3 days. The round cocci increased first after 2-3 days and then decreased slowly after 4-5 days. Lactobacilli began to increase in number (more than ten billion per g silage) first after 6 days. The results showed that the pH change during silage fermentation was mainly lowered by streptococci, and in MRS medium the pH was more rapidly lowered by Streptococcus faecalis, than by Lactobacillus plantarum and other rods. (Long-Battelle)
W72-13683

A DEVICE FOR COLLECTING IN-SITU SAMPLES OF SUSPENDED SEDIMENT FOR MICROSCOPIC ANALYSIS,
Johns Hopkins University, Baltimore, Md. Chesapeake Bay Inst.
J. R. Shubel, and E. W. Schiemer.
Journal of Marine Research, Vol 30 No. 2, p 269-273,May 15, 1972. 3 fig.

Descriptors: *Sampling, *On-site data collection, *Freezing, *Sediments, Freeze drying, Microscopy, Electron microscopy, Pollutant identification.
Identifiers: *Suspended sediments, Sampling device, Light microscope.

An in-situ sampler for collecting small samples of suspended sediment for microscopic analysis has been built and tested. The device rapidly freezes a thin layer of water entrapping all of the suspended particles in it; when the sampler is recovered, the disc of ice is placed on a suitable substrate and freeze-dried. The particles can then be examined in an undisturbed state with a light microscope or with an electron microscope. (Galwardi-Texas)
W72-13693

THIN-LAYER CHROMATOGRAPHIC-ENZYMATIC IDENTIFICATION OF SOME LINDANE- AND POSSIBLE DDT-METABOLITES AS WELL AS PENTACHLOROPHENOL, (DUNNSCHICHTCHRO-MATOGRAPHISCH-ENZYMATISCHER NACHWEISEINIGER LINDAN-UND THEORETISCH MOGLICHER DDT-METABOLITEN SOWIE VON PENTACHLORPHENOL).
Federal Biological Inst. for Land and Forestry, Berlin (West Germany). Inst. for Plant Preservation Research.
F. Geike.
Journal of Chromatography, Vol 67, No 2, p 343-349, May 3, 1972. 4 tab, 16 ref. English summary.

Descriptors: *Pollutant identification, *DDT, Separation techniques, Organic compounds, Chlorinated hydrocarbon pesticides, Ultraviolet radiation.
Identifiers: *Thin layer chromatography, *Metabolites, *Enzymatic inhibitors, *Pentachlorophenol, Lindane, Amylase, p-chlorobenzaldehyde, p-chlorobenzoic acid, Benzophenone, Chlorobenzene, Benzoic acid, 1 2 4 5 tetrachlorobenzene, 1 2 3 trichlorobenzene, 1 2 4 trichlorobenzene.

The possible identification of p-chlorobenzaldehyde, p-chlorobenzoic acid, benzophenone, chlorobenzene, benzoic acid, pentachlorophenol, 1,2,4,5-tetrachlorobenzene, 1,2,3-trichlorobenzene, and 1,2,4-trichlorobenzene by their inhibition of the enzymes bovine liver esterase, trypsin, acid and alkaline phosphatase, alpha-and beta-amylase on thin-layer plates was investigated. Pentachlorophenol was a strong inhibitor of all enzymes studied and was detected in the range of 10 ng with bovine liver esterase to 3 micrograms with alpha-amylase. Benzophenone showed strong inhibition against the phosphatases, while a moderate effect was observed for the other enzymes. Chlorobenzene could not be identified by inhibition of any of the enzymes by this technique. The other substances showed a very different behavior and were often only inhibitory after UV irradiation. (Long-Battelle)
W72-13760

A TECHNIQUE FOR CURIE POINT PYROLYSIS GAS CHROMATOGRAPHY OF COMPLEX BIOLOGICAL SAMPLES,
Stichting voor Fundamenteel Onderzoek der Materie, Amsterdam (Netherlands). Istituut voor Atoom en Molecuulfysica.
H. L. C. Meuzelaar, and R. A. in't Veld.
Journal of Chromatographic Science, Vol 10, No 4, p 213-216, April 1972. 3 fig, 18 ref.

Descriptors: *Methodology, Gas chromatography, Pollutant identification, Systematics, Classification, Water pollution sources.
Identifiers: *Curie point pyrolysis gas chromatography, *Biological samples, *Reproducibility, Neisseria meningitides, Neisseria sicca, Sample preparation, Performance evaluation, Pyrograms, Pyrolysis gas chromatography.

Curie-point pyrolysis gas chromatography is considered to be a very promising technique to be used in the classification and identification of complex biological samples. A technique is described which utilizes a special sample preparation procedure in which 5-15 microliters of a uniform, opalescent suspension of the insoluble biological sample is applied in small drops to a filament by means of a microsyringe with glass tips. The ferromagnetic filament is held in a horizontal position and rotates slowly to insure uniform distribution of the sample, while the liquid evaporates. The coated filament is then inserted into a Pyrex reaction tube which is designed to fit into the special pyrolysis unit. The pyrolysis unit is directly coupled to a capillary column and allowed exchange of reaction chambers after each analysis. Strains of Neisseria meningitides and N. sicca were used to evaluate the performance of the system. A comparison of the pyrograms shows that the level of qualitative as well as quantitative reproducibility is such that pyrograms from the same sample are almost superimposable. (Byrd-Battelle)
W72-13761

THE QUANTIMET 720P FOR ROUTINE BIOLOGICAL ASSAY AND POTENCY CALCULATION FROM COLONY COUNT, INHIBITION AND EXHIBITION ZONE MEASUREMENTS,
Imanco Ltd., Royston (England).
For primary bibliographic entry see Field 05B.
W72-13762

VARIATION OF PRECISION WITH TIME FOR AUTOANALYZER DATA,
Institute of Rural Science, Aberystwyth (Wales). Analytical Lab.
For primary bibliographic entry see Field 07B.
W72-13763

OSMOTIC STABILITY AND SODIUM AND POTASSIUM CONTENT OF L-FORMS OF STREPTOCOCCUS FAECALIS,
Wadsworth General Hospital, Los Angeles, Calif.
For primary bibliographic entry see Field 05C.
W72-13764

A REVIEW OF THE METHODS FOR THE IDENTIFICATION OF PERSISTENT HYDROCARBON POLLUTANTS ON SEAS AND BEACHES,
Shell Research Ltd., Chester (England). Thornton Research Center.
E. R. Adlard.
Journal of the Institute of Petroleum, Vol 58, No 560, p 63-74, March 1972. 12 fig, 3 tab, 37 ref.

Descriptors: *Oil wastes, *Persistence, *Analytical techniques, *Pollutant identification, Oil spills, X-ray fluorescence, Mass spectrometry, Separation techniques, Gas chromatography, Flame photometry, Trace elements, Oil pollution, Colorimetry, Neutron activation analysis, Tracers, Oceans, Beaches, Oil, Centrifugation, Specific gravity, Sulfur, Nitrogen, Boron, Weathering, Heavy metals, Organic compounds, Zinc, Strontium, Lead, Nickel, Molybdenum, Copper, Chromium, Cobalt, Cesium, Potassium, Sodium, Manganese, Magnesium, Calcium, Titanium, Iron, Water pollution sources, Tagging.
Identifiers: *Hydrocarbons, Sample preservation, Infrared spectroscopy, Ultraviolet spectroscopy, Paper chromatography, Thin layer chromatography, Column adsorption chromatography, Emission spectroscopy, Atomic absorption spectroscopy, Fuel oil, Microwave spectroscopy, Crude oil, Oil characterization, Flame ionization gas chromatography, Flame photometric gas chromatography, Flame ionization detector, Sample preparation, Flame photometric sulfur detector, Cleanup, Wax, Asphaltenes, Kjeldahl procedure, Oxygen flask combustion, Fingerprinting, Uranium, Zirconium, Vanadium, Tin, Barium, Silver, Gallium, Neodymium, Lanthanum, Detection limits.

The literature regarding sampling and analysis of oil wastes is reviewed and evaluated. A wide variety of analytical techniques are discussed and the feasibility of labelling crude oil is considered. It is concluded that there is no shortage of methods for identifying oily pollutants. Among the techniques reviewed, those most likely to be generally available are infrared spectroscopy, emission spectroscopy, gas chromatography, and thin-layer chromatography. A standard gas chromatographic method for pollutant identification has been established by the British Institute of Petroleum and other techniques will perhaps be standardized in the future. Labelling all oil-carrying ships is not feasible. All the methods suggested for labelling crude oil cargos have severe technical limitations and there would be serious problems with international recognition and administration. (Mortland-Battelle)
W72-13766

STUDIES ON THE DETERMINATION OF PHYSIOLOGICAL LEVELS OF CHROMIUM IN SERUM BY GAS CHROMATOGRAPHY,
Florida Univ., Gainesville. Dept. of Pathology.
J. Savory, M. T. Glenn, and J. A. Ahlstrom.
Journal of Chromatographic Science, Vol 10, No 4, p 247-252, April 1972. 3 fig, 5 tab, 8 ref.

Descriptors: *Chromium, Chemical analysis, *Gas chromatography, Proteins, Chemical precipitation, Separation techniques, Urine, Aqueous solutions, Trace elements, Heavy metals.

Identifiers: *Serum, *Electron capture gas chromatography, Chromium trifluoroacetylacetonate, Electron capture detector, Scintillation counting, Blood, Ashing, Biological samples, Chemical interference, Precision.

A gas chromatographic procedure developed for measuring chromium in serum involves the extraction of chromium as chromium trifluoroacetylacetonate and the utilization of an electron capture detector. The chromium is coprecipitated with serum proteins thus eliminating ionic interference. Using this procedure, recoveries of chromium (III) added to serum averaged 75 percent; the precision of replicate determinations was 14.4 percent; and normal values obtained were 2.7-24 micrograms per liter. Other techniques were also investigated, including direct extraction with no prior treatment and wet-and dry-ashing, but they yielded poor recoveries of chromium (III). (Mortland-Battelle)
W72-13767

NEW METHODS FOR DETECTION AND QUANTIFICATION IN THIN-LAYER CHROMATOGRAPHY: A STUDY OF PYROLYSIS AND COMBUSTION SYSTEMS,
Federal Inst. for Lipid Research, Muenster (West Germany).
K. D. Mukherjee, H. Spaans, and E. Haahti.
Journal of Chromatographic Science, Vol 10, No 4, p 193-200, April 1972. 4 fig, 4 tab, 15 ref.

Descriptors: *Chemical analysis, *Organic compounds, Lipids, Pollutant identification, Organic acids, Hexadecanol, Alcohols, Methodology.
Identifiers: *Thin layer chromatography, *Pyrolysis, *Detection, *Combustion, Cholesterol, Triglycerides, Flame ionization detector, Thermal conductivity detector, Palmitic acid, Fatty acids, Waxes.

A scanning system has been developed for detecting organic solute zones on thin-layer chromatograms. Chromatography is carried out in quartz or Pyrex tubes whose internal walls are coated with a thin layer of adsorbent. The thin-layer tubes are passed gradually through a furnace while the tubes are being purged with nitrogen. The solutes are consecutively vaporized, either by pyrolysis or by combustion depending upon whether a pure adsorbent or an adsorbent containing an oxidizing agent is used. The products of pyrolysis are monitored by an FID, either directly, or after their oxidation to carbon dioxide and subsequent reduction to methane. Similarly, carbon dioxide formed by in situ combustion of solute zones on layers containing cupric oxide is reduced to methane and detected by the FID. The performance of these detection systems has been tested with model mixtures of lipids and lipid extracts of biological origin. Further applications of these methods are outlined. (Snyder-Battelle)
W72-13768

ON CALCULATION OF THE AREAS OF OFF-CHART CHROMATOGRAPHIC PEAKS USING DATA OBTAINED WITH THE AID OF INTEGRATORS,
Akademiya Nauk SSSR, Moscow. Institut Organicheskoi Khimii.
For primary bibliographic entry see Field 07B.
W72-13769

ON-LINE COMPUTER-CONTROLLED ELECTRICAL DETECTION IN SPARK SOURCE MASS SPECTROMETRY,
Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
For primary bibliographic entry see Field 07B.
W72-13770

GAS LIQUID CHROMATOGRAPHIC ANALYSIS OF HYDROCARBON MIXTURES. A REPORT ON THE WORK OF THE INTERNATIONAL CONFERENCE OF BENZOLE PRODUCERS,
International Conference of Benzole Producers, Paris (France).
K. H. V. French.
Journal of Chromatography, Vol 67, No 2, p 237-245, May 3, 1972. 3 fig, 4 tab, 3 ref.

Descriptors: *Instrumentation, *Methodology, *Gas chromatography, Laboratory equipment, *Organic compounds, Mathematical studies, Aromatic compounds, Chemical analysis, Calibrations.
Identifiers: *Hydrocarbons, *Gas liquid chromatography, *Precision, *Mixtures, Aromatic hydrocarbons, Aliphatic hydrocarbons, Interlaboratory studies, Errors, Reproducibility, Repeatability, Katharometers, Flame ionization detector, Toluene, Organic solvents, Hexane, Cyclohexane, Methylcyclopentane, Ethylbenzene, Octane, Nonane, Xylene, Mesitylene, Isopropylbenzene, Alkanes.

The International Conference of Benzole Producers (ICBP), through interlaboratory studies, has determined the precision attainable with minimum apparatus and procedure standardization in the analysis of hydrocarbon mixtures. The results from samples of each hydrocarbon mixture analyzed by the participating laboratories were averaged and the precision obtained was in the range of 0.001-30 percent. Some of the conclusions reached were that (1) katharometers and flame ionization detectors give equally precise results down to the 0.1 percent (w/w) level. Flame ionization detectors give satisfactory precision down to 0.001 percent (w/w); (2) a major source of error could be associated with synthetic mixtures; and (3) the repeatability and reproducibility of experiments could be 3 and 8 percent, respectively, if the instructions for the determination of response factors are strictly followed. Some of the ICBP recommendations include the following: (1) A peak of a standard should have an area in the same order as the components being determined, preferably a peak at least 5.0 cm high and 0.5 cm wide at half-peak height. (2) If an internal standard is used it must be resolved from components being determined and impurities. (3) Response factors should be the mean of values calculated from chromatograms on two synthetic mixtures and should differ by less than 4 percent. (Long-Battelle)
W72-13771

THE PRESENT STATUS AND FUTURE PROSPECT OF THE TURBIDOSTAT,
National Chemical Research Lab., Pretoria (South Africa).
T. G. Watson.
Journal of Applied Chemistry and Biotechnology, Vol 22, No 2, p 229-243, February 1972. 11 fig, 31 ref.

Descriptors: *Cultures, *Growth rates, *Microorganisms, Monitoring, Population, Measurement, Instrumentation, Bioindicators, Bacteria, Photometry, Productivity, Density, Pumps, Hydrogen ion concentration, Carbon dioxide, Nutrients, Proteins, E. coli, Gases, Turbidity.
Identifiers: *Turbidostats, Chemostats, Sensors, Continuous cultures, Batch cultures, Klebsiella aerogenes, DNA, RNA, Ethanol, Biosynthesis, Pyruvate, Substrate utilization.

Due to the need to culture organisms continuously at or near the maximum specific growth rate, a task for which the chemostat is unsuitable, use of the turbidostat is growing. The turbidostat controls organism concentration directly and not dilution rate; therefore it operates most successfully close to the maximum specific growth rate where the organism concentration changes rapidly with dilution rate. The functioning of turbidostats, potential uses and some representative studies in which they have been used are discussed. Methodology for the monitoring of population density, including use of photo-electric sensors, pH sensors, and gas-concentration sensors, and for the control and monitoring of nutrient additions is reviewed. The turbidostat still has rather limited appeal because other techniques in many circumstances offer more convenient methods of approach. However, recent interest in transient, periodic, and oscillatory phenomena in microbial populations is giving impetus to the turbidostat. For example, it has been used in a study of the effect of ethanol on the maximum specific growth rate of Klebsiella aerogenes, for a study of induced oscillatory phenomena in K. aerogenes in the presence of various drugs, and for a study on the regulation of pyruvate biosynthesis in E. coli. (Mortland-Battelle)
W72-13772

A NEW REAGENT FOR DETECTING TRYPTOPHAN, INDOLE, AND INDOLE-3-ACETIC ACID IN THIN-LAYER CHROMATOGRAPHY,
Naval Medical Research Unit No. 3, Cairo (Egypt). Dept. of Medical Zoology.
F. N. Boctor.
Journal of Chromatography, Vol 67, No 2, p 371-372, May 3, 1972. 1 tab, 2 ref.

Descriptors: *Amino acids, Separation techniques, Methodology, Pollutant identification, Color reactions, Chemical reactions, Solvents.
Identifiers: *Indole, *Tryptophan, *Indole-3-acetic acid, *Thin layer chromatography, *Chromagenic reagents, *Phosphoric acid, Detection limits, Sensitivity, p-Dimethylaminobenzaldehyde, Alanine, Arginine, Aspartic acid, Cysteine, Glutamic acid, Glycine, Histidine, Lysine, Hydroxyproline, Isoleucine, Methionine, Phenylalanine, Proline, Serine, Threonine, Tyrosine, Valine.

Tryptophan and 18 other amino acids, indole, and indole-3-acetic acid were analyzed by thin-layer chromatography to determine the suitability of phosphoric acid as a chromagenic reagent. The amino acids were dissolved in 0.1 N HCl and indole and indole-3-acetic acid in 2 ml ethanol, with a resulting concentration of 100 mg/100 ml. 0.5, 1, 2, 5, 10 microliters of each component were spotted on a 250 millicron silica gel thin-layer plate. After the butanol-acetic acid-water (65:13:22) solvent had travelled 10 cm, the plate was left to dry, sprayed with phosphoric acid reagent, and heated for 40 min at 110 degrees. The eighteen standard amino acids, except tryptophan, gave no color with the reagent. Tryptophan, indole, and indole-3-acetic acid gave different colors. The sensitivity of the reagent was of the same order as that of DMAB. After chromatographic separation, 0.5 micrograms could be detected but before separation 0.005 micrograms gave the colors. This method depends on a reaction between phosphoric acid and tryptophan, indole, and indole-3-acetic acid. The nature and mechanism of the reaction are unknown. (Long-Battelle)
W72-13773

AN ARTIFACT IN THE GAS CHROMATOGRAPHIC DETERMINATION OF IMPURITIES IN PENTACHLOROPHENOL,
Umea Univ., (Sweden). Dept. of Organic Chemistry.
C. Rappe, and C. A. Nilsson.
Journal of Chromatography, Vol 67, No 2, p 247-253, May 1972. 7 fig, 7 ref.

Descriptors: *Gas chromatography, *Mass spectrometry, *Halogenated pesticides, *Herbicides, Chemical analysis, Organic compounds, Analytical techniques, Pesticides, Pollutant identification.
Identifiers: *Pentachlorophenol, *Chemical impurities, Isomers, Chemical interference, Flame ionization gas chromatography.

Commercial samples of pentachlorophenol were analyzed by gas chromatography and mass spectrometry. The main impurity was found to be 3,4,5,6-tetrachloro-2- (2,3,4,5,6-pentachlorophenoxy) phenol. In gas chromatographic analyses using a heated injection block, the impurity underwent a ring closure yielding a dioxin impurity which suggests the possibility of its occurrence in commercial samples. Isomers of pentachlorophenol also were identified as impurities during direct inlet mass spectrometry. In another set of experiments pentachlorophenol was treated with diazomethane to facilitate separation of impurities, since methoxy ethers are easier to separate than phenols. A methoxy ether of the phenol compound was found. Chlorinated phenoxyphenols have not been previously observed as contaminants in chlorinated phenols. (Long-Battelle)
W72-13774

COMPLEXATION OF METAL IONS WITH NATURAL POLYELECTROLYTES (REMOVAL AND RECOVERY OF METAL IONS FROM POLLUTED WATERS),
Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Chemistry.
H. H. G. Jellinek, and S. P. Sangal.
Water Research, Vol 6, No 3, p 305-314, March 1972. 3 fig, 1 tab, 8 ref.

Descriptors: *Heavy metals , *Ions, Solvent extractions, Chemical precipitation, Water quality control, Water pollution, Chelation, Cations, Copper, Zinc, Cadmium, Nickel, Chromium, Separation techniques, Water analysis.
Identifiers: *Polyelectrolytes, *Recovery, *Complexation, Complexing agents, Albumin, Gelatine, Polygalacturonic acid.

A number of complexation experiments were performed with natural polyelectrolytes in order to ascertain their suitability for metal (Cu, Cd, Zn, Ni, Cr) removal and recovery from water. Bovine albumin-polymethyacrylic acid (PMMA), gelatine-PMMA, gelatin-alginic acid, pectin, gelatin-oxidized starch, and polygalacturonic acid (PGA) were complexing agents employed in the testing with special emphasis on PGA. Solutions containing known amounts of metal ions were complexed with PGA and maximum weight percentages of the metal ions calculated (percent w/w): Cu 98.5, Cd 88.5, Zn 80, Ni 70, and Cr 77. Thus, PGA proved to be an efficient complexation agent for these metals and increased the ratio of the volumes of the original metal solutions to those of the metal solutions extracted from the solid polymer complex several hundred fold. Only small amounts of polymer were lost during extraction of the metal ions from the complexes by hydrochloric acid, so that multiple complexation cycles can be carried out by replenishing only the small amounts of polymer lost. (Mackan-Battelle)
W72-13776

NICKEL POLLUTION,
University Coll. of Wales, Aberystwyth. Dept. of Agricultural Biochemistry; and University Coll. of Wales, Aberystwyth. Dept. of Biochemistry.
W. M. Ashton.
Nature, Vol 237, No 5349, p 46-47, May 5, 1972. 3 tab, 3 ref.

Descriptors: *Nickel, *Soil contamination, *Vegetation, Pollutants, Trace elements, Chemical analysis, Copper, Gravimetric analysis, Air pollution effects, Pollutant identification, Soil analysis, Heavy metals.
Identifiers: *Atomic absorption spectrophotometry, *Wales.

Herbage and soil samples were obtained from a farm in South Wales near a large nickel works to determine the possibility of airborne nickel contamination. Ashed herbage and air-dried soil samples obtained in 1934 contained sufficient nickel for the analysis of HCl extracts by the dimethylglyoxime procedure. Leaf samples analyzed contained large amounts of nickel; however, washing the leaves removed most of the nickel from the surface of the leaves. Only minute traces of nickel and copper were found in washed peeled potatoes. Six samples of vegetation and soil obtained in 1971 were analyzed by atomic absorption spectrophotometry. The vegetation contained 1.3-2.0 ppm of nickel, the first inch of topsoil 625-1150 ppm, and the second inch of topsoil 200-350 ppm. This represents a marked decrease in nickel contamination since the 1930's. (Synder-Battelle)
W72-13778

METABOLISM OF POLYCHLORINATED NORBORNENES BY CLOSTRIDIUM BUTYRICUM,
Mainz Univ. (West Germany). Institut fuer Anorganische Chemie und Kernchemie.
For primary bibliographic entry see Field 05B.
W72-13779

RAPID METHOD FOR DETECTION AND CHARACTERIZATION OF STEROIDS,
California Univ., Berkeley. Dept. of Chemistry.
G. Steel, and W. Henderson.
Analytical Chemistry, Vol 44, No 7, p 1302-1304, June 1972. 1 fig, 1 tab, 10 ref.

Descriptors: *Mass spectrometry, Lake sediments, Aquatic soils, *California, Ethers, Separation techniques, Organic compounds, Alcohols, Water analysis, Chemical analysis, Aquatic life.
Identifiers: *Steroids, *Liquid solid chromatography, *Biological samples, *Thin layer chromatography, Sample preparation, Stigmaster, Fucosterol, *Mono Lake (Calif), Cholesterol, Brassicasterol, Campesterol, Stigmasterol, Cholestanol, Ergosta-7 22-diene-3 beta-ol, beta-Sitosterol, Stigmasta-5 25-diene-3 beta-ol, 24-methylenecholesterol, Sterols, Characterization, Trimethylsilylation, Mass spectra.

Samples of macro- and microorganisms, lake water, bottom muds, and consolidated sediments taken from Mono Lake, California were analyzed for steroids using mass spectrometry. Crude sterol fractions were isolated by liquid-solid chromatography followed by treatment with a trimethylsilylation reagent for thin-layer chromatographic separation. The resulting silyl ethers were then analyzed by a temperature programmed direct inlet probe mass spectrometer and compared to standard sterol silyl ethers. Cholesterol, brassicasterol, campesterol, and stigmasterol were identified from these samples. (Long-Battelle)
W72-13781

SPECTROPHOTOMETRIC METHOD FOR DETERMINING LOW LEVELS OF WATER-SOLUBLE BORON IN FERTILIZERS,
Forest Products Lab., Madison, Wis.
H. P. Peterson, and D. W. Zoromski.
Analytical Chemistry, Vol 44, No 7, p 1291, June 1972. 1 tab, 3 ref.

Descriptors: *Boron, *Fertilizers, *Spectrophotometry, Chemical analysis, Nitrites, Nitrates, Aqueous solutions, Methodology, Separation techniques, Color reactions, Chemical reactions, Solvent extractions.
Identifiers: Recovery, Absorbance, Chemical interference, Sample preparation, Sensitivity.

A spectrophotometric method for determining low levels of water-soluble boron in fertilizers utilizes the carmine color development after the boron has been extracted and interfering impurities removed with 2-ethyl-1,3-hexanediol in chloroform. After extraction, aliquots are acidified with HCl and H2S04 and a known volume of carmine solution added. Absorbance of the colored solution is measured at 600 nm against a reagent blank. Recovery of boron increased with a diol concentration up to ten percent; the described procedure gave a 90 percent recovery using a 10 percent diol solution. A 5-minute extraction with an aqueous NaOH solution resulted in maximum recovery of boron. Six commercially available inorganic fertilizers were analyzed for boron by this method. Samples of each of these fertilizers were spiked with known amounts of boric acid and again analyzed. Average recovery for these samples was 102.4 percent. (Synder-Battelle)
W72-13782

DETERMINATION OF SUBMICROGRAM AMOUNTS OF BORON USING THE B-10 (N, ALPHA) LI-7 REACTION,
Eastman Kodak Co., Rochester, N.Y. Research Labs.
M. Lelental.
Analytical Chemistry, Vol 44, No 7, p 1270-1272, June 1972. 5 fig, 13 ref.

Descriptors: *Boron, *Radiochemical analysis, *Chemical reactions, Pollutant identification, Aqueous solutions, Gamma rays, Measurement, Adsorption, Electron microscopy, Radioactivity techniques.
Identifiers: *Scanning electron microscopy, Lithium, Plastics, Detectors, Chemical interference, Alpha emission, Boron radioisotopes, Lithium radioisotopes, Detection limits, Neutron irradiation, Li-6, Li-7, B-10, Biological samples.

A technique which utilizes electron microscopy for the measurement of submicrogram quantities of boron in aqueous solutions and biological samples is based on the utilization of the B-10 (n, alpha) Li-7 reaction and the measurement of gamma or alpha radioactivity after the completion of activation. The detection of radioactivity involves a microscopic examination of tracts produced on plastics of cellulose esters, namely, cellulose butyrate, cellulose triacetate, and cellulose nitrate. In order to reduce statistical error to below 4 percent, radioactivity counting for boron determination covers areas of the micrograph containing approximately 1000 tracts. The limit of the quantitative determination of boron by this method was estimated to be 38 nanograms B/sq cm. The very low level of background made this limit of sensitivity possible. Hence, this method is the most sensitive known for boron determinations. Since it is based upon a nuclear reaction, and thus does not suffer from the limitations imposed by spectrophotometric methods, it can be applied to all boron compounds. This method is singularly free from interference by other elements. Lithium-6 (present to the extent of 7.6 percent in natural lithium) is the only element that will produce the tracks obtained with B-10. The sampling limitation requires that the boron-containing material be in a layer of a thickness less than the alpha particles/range to preclude detection loss caused by self-absorption. The procedure offers significant possibilities in the study of processes dealing with the adsorption of boron compounds or the spatial distribution of microgram amounts of boron. (Long-Battelle)
W72-13784

MEASUREMENTS OF VERY LOW OXYGEN TENSIONS IN UNSTIRRED LIQUIDS,
Waterloo Univ. (Ontario). Dept. of Physics.
C. J. Koch, and J. Kruuv.
Analytical Chemistry, Vol 44, No 7, p 1258-1263, June 1972. 7 fig, 2 tab, 15 ref.

Descriptors: *Measurement, *Liquids, *Instrumentation, *Dissolved oxygen, *Pressure, Water vapor, Laboratory equipment, Membrane processes, Electrodes, Nitrogen, Carbon dioxide, Polarographic analysis.
Identifiers: *Oxygen electrodes, Oxygen tension.

A number of problems have been encountered in using a commercial membrane-covered, polaro-

graphic oxygen micro electrode. The sources of the large zero currents have been analyzed and found to be attributable to various physical factors. The single greatest cause has been found to be water vapor which was eliminated by using a desiccant in the measuring chamber. Membrane application and dissolved oxygen in the body of the electrode were also important especially with respect to long-term sensitivity and zero current stability. Through the solution of these problems the useful range of the oxygen cathode has been extended to less than 50 parts per million in gases or about 0.06 micromole in liquids. (Long-Battelle)
W72-13785

IDENTIFICATION OF ORGANOCHLORINE PESTICIDE RESIDUES BY ULTRAVIOLET SOLID-PHASE PHOTOLYSIS,
Agricultural Research Service, Beltsville, Md. Soils Lab.
D. E. Glotfelty.
Analytical Chemistry, Vol 44, No 7, p 1250-1254, June 1972. 5 fig, 1 tab, 5 ref.

Descriptors: *Ultraviolet radiation, *Pollutant identification, *Chlorinated hydrocarbon pesticides, *Pesticide residues, Methodology, Gas chromatography, Halogenated pesticides, Chemical analysis, Aldrin, Dieldrin, Heptachlor, DDD, DDT, DDE, Water pollution sources, Organic pesticides.
Identifiers: *Photolysis, *Electron capture gas chromatography, Gas liquid chromatography, Sample preparation, Heptachlor epoxide, 1-hydroxychlordene, trans-chlordane, Chlordane, Nonachlor, Electron capture detector, Metabolites, Isomers, p p'DDT, p p'DDD, p p'DDE.

A simple, rapid method is given for the identification of nanogram quantities of organochlorine insecticide residues in soil, water, and plant extracts. The pesticides tested included aldrin, dieldrin, heptachlor, heptachlor epoxide, l-hydroxychlordene, trans-chlordane, chlordene, nonachlor, and p,p' isomers of DDD. The hexane-extracted pesticides were irradiated in silica reaction cells with UV light for 30 min and analyzed by electron capture gas liquid chromatography. Liquid-phase photolysis was also performed for comparison of products formed. Water, soil and plant material samples were analyzed preliminarily by accepted EC-GLC procedures to locate and quantitate possible pesticide peaks. The concentration of the extract was then adjusted to approximate that of a pesticide standard solution. Only two compounds, nonachlor and p,p'-DDD, failed to undergo significant degradation in the allotted exposure time. Dieldrin and p,p'-DDE degraded completely, and the remaining parent peaks were small for 1-hydroxychlordene, chlordene, and aldrin. Heptachlor epoxide, trans-chlordane, chlordene, and p,p'-DDT, each gave one major product, whose GLC peak height was approximately 80 percent of the original nonirradiated parent peak. Thirty-minute exposure of p,p'-DDE was much too severe, resulting in complete destruction of all photolysis peaks. The optimum exposure time was 30 seconds, in which about 90 percent of the parent p,p'-DDE was degraded and the maximum concentration of products was attained. Aldrin could not be identified in the presence of dieldrin because the three most abundant degradation peaks were identical to those obtained by the exposure of dieldrin. (Long-Battelle)
W72-13786

PRECISION OF ELECTRICAL DETECTION MEASUREMENTS OF POWDERED SAMPLES IN SPARK SOURCE MASS SPECTROMETRY,
Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
G. H. Morrison, and B. N. Colby.
Analytical Chemistry, Vol 44, No 7, p 1206-1210, June 1972. 4 fig, 6 tab, 10 ref.

Descriptors: *Trace elements, Data processing, Pollutant identification, Automation, Strontium radioisotopes, Heavy metals, Data collections, Manganese, Iron, Copper, Magnesium, Chromium, Titanium, Strontium, Alkaline earth metals, Water pollution.
Identifiers: *Detection, *Powered samples, *Spark source mass spectrometry, *Precision, Biological samples, Graphite electrode, Sample preparation, Chemical interference, Zirconium, Vanadium, Rubidium, Yttrium, Mass spectra, Mg-26, Cr-52, Mn-55, Fe-56, Cu-63, Zr-64, Cu-65, Ti-46, Ti-47, V-51, Sr-88, Pb-85, Y-89, Zr-90, Zirconium radioisotopes, Vanadium radioisotopes, Rubidium radioisotopes, Yttrium radioisotopes, Titanium radioisotopes, Manganese radioisotopes, Chromium radioisotopes, Iron radioisotopes, Copper radioisotopes, Magnesium radioisotopes.

The feasibility of using electrical detection as a means of improving spark source mass spectrometric precision has been studied in the analysis of graphite blended powdered samples. All data were obtained from real and synthetic graphite samples using a Nuclide GRAF-2 spark source mass spectrometer with a computer on-line electrical detection system. After analyzing a variety of sample powders with this system, it was found that an analytical precision on the order of 3-6 percent can be expected. Electrostatic peak switching and computer on-line data acquisition and evaluation helped keep measurement time to a minimum. Several methods of sample pretreatment were used and the resulting electrode homogeneity was evaluated. (Byrd-Battelle)
W72-13787

METHOD FOR DETERMINATION OF MERCURY IN BIOLOGICAL MATERIALS BY NEUTRON ACTIVATION ANALYSIS,
National Bureau of Standards, Washington, D.C. Activation Analysis Section.
H. L. Rook, T. E. Gills, and P. D. LaFleur.
Analytical Chemistry, Vol 44, No 7, p 1114-1117, June 1972. 1 fig, 4 tab, 27 ref.

Descriptors: *Neutron activation analysis, *Mercury, *Pollutant identification, Methodology, Fish, Separation techniques, Leaves, Coals, Sediments, Freeze drying, Radiochemical analysis, Mass spectrometry, Trace elements, Heavy metals, Gamma rays, Aquatic soils, Soil analysis, Radioactivity techniques, Tracers, Evaluation.
Identifiers: *Biological materials, Orchard leaves, Wheat flour, Precision, Recovery, Sample preparation, Biological samples, Gamma spectrometry, Fuel oil, Tissue, Liver, Hg-203, Method validation.

A method is described for the determination of mercury in a variety of matrices. For analysis 0.5-gram samples were encapsulated in cleaned, heat treated quartz tubes, irradiated, washed in nitric acid and ignited. After combustion, the ash was heated to about 800 C for 5 min removing all volatile components from the sample into a condenser which was washed in nitric acid. The resulting solution was counted using a high efficiency, high resolution Ge (Li) gamma ray spectrometer. Additions analysis was used to determine if mercury were lost during analysis. The method was first tested for complete recovery of mercury by burning non-irradiated samples of orchard leaves with Hg-203 tracer added. A total of eight separations was carried out with a mean recovery of 99.52 percent and a relative standard deviation of plus or minus 1.68 percent. To test the recovery of mercury incorporated into an organism, Hg-203 nitrate was added to the water in a tank containing goldfish. Dead fish were removed from the tank, frozen, lyophilized, and counted whole, followed by analysis for Hg-203 using the combustion technique. Experimental results showed a mean recovery of 98.9 percent with a relative standard deviation of plus or minus 1.0 percent. The method was checked by analyzing samples of flour and coal having mercury concentrations ranging from 0.01 to 5 ppm. Where mercury levels were high enough (greater than 1 ppm), samples were analyzed nondestructively by irradiation followed by direct counting of the Hg-197. These samples were then analyzed by the described combustion technique and the results compared. The procedure has subsequently been used to determine the Hg concentration of two new Standard Reference Materials, Orchard Leaves and Beef Liver, being offered by the National Bureau of Standards. (Long-Battelle)
W72-13788

DETERMINATION OF FLUORIDE IN VEGETATION USING THE SPECIFIC ION ELECTRODE,
Diamond Shamrock Chemical Co., Baltimore, Md. Chemetals Div.
R. L. Baker.
Analytical Chemistry, Vol 44, No 7, p 1326-1327, June 1972. 1 fig, 1 tab, 4 ref.

Descriptors: *Fluorides, *Vegetation, *Separation techniques, Chemical analysis, Bioassay, Ions, Evaluation, Measurement, Pollutant identification.
Identifiers: Ion selective electrodes, Sample preparation, Chemical interference.

The determination of fluoride in vegetation with a fluoride specific ion electrode is less time-consuming than the Willard and Winter distillation technique or modifications thereof. It does not require constant monitoring by the analyst, and a minimum amount of reaction apparatus is required. A 25- to 30-gram vegetation sample was collected and the dry weight calculated from a uniform 10-gram sample. Ten millimeters of sodium hydroxide was added to a 5-10 gram sample which was dried for 2 hr at 150 C, fused for 2 hr at 550 C, cooled, and then dissolved in 25 ml of water. The sample was then diluted to 50 ml, filtered, and aliquots were analyzed. Generally, not more than 0.10 ml of 1000 micrograms/ml fluoride solution was necessary to obtain a reading with the electrode. The accuracy and precision of the method was plus or minus 10 percent. The effects of fusion temperature and interfering ions were not studied since there was excellent agreement between the distillation and fusion methods. The distillation method removed all interferences while the fusion standard addition method effectively canceled them out. (Synder-Battelle)
W72-13789

EMISSION SPECTROMETRIC DETERMINATION OF TRACE AMOUNTS OF MERCURY,
Colorado State Univ., Fort Collins. Dept. of Chemistry.
F. E. Lichte, and R. K. Skogerboe.
Analytical Chemistry, Vol. 44, No. 7, p 1321-1323, June 1972. 1 fig, 2 tab, 12 ref.

Descriptors: *Mercury, *Trace elements, Leaves, Heavy metals, Reduction (Chemical), Pollutant identification, Chemical analysis, Water analysis, Spectroscopy.
Identifiers: *Emission spectrometry, Microwave plasma excitation, Atomic absorption spectrophotometry, Cold vapor atomic absorption spectrophotometry, Sample preparation, Biological samples, Blood, Precision, Detection limits, Accuracy.

Microwave plasma excitation (emission spectrometry) which utilizes the reduction-vaporization approach was used to determine ultratrace concentrations of mercury in a variety of sample types. For most analyses, a sample solution volume of 0.1-0.5 ml was adequate, but was increased to an appropriate size for samples having an unusually low concentration. For emission spectrometric determinations using standard solutions, the detection limit was estimated to be 0.6

picogram. Quantitative measurements on 10-ml samples containing 0.01 ppb mercury were made with a precision of plus or minus 10-12 percent. To test the accuracy of the method samples of blood, leaves, concentrated H2SO4 and triply distilled water were analyzed by emission and the cold cell atomic absorption techniques. Duplicate results generally agreed within 10 percent for both techniques indicating that the comparative results are consistent within experimental error. It should be noted that the emission analyses were carried out on amounts of mercury ranging from 0.34 to 12 ng (distilled water and leaf B samples, respectively), while the absorption measurements covered the absolute range of 17 to 60 ng. This is indicative of the relative analysis capabilities of the two techniques. (Snyder-Battelle)
W72-13790

SEMIINTEGRAL ELECTROANALYSIS: THEORY AND VERIFICATION,
Trent Univ., Peterborough (Ontario).
For primary bibliographic entry see Field 02K.
W72-13791

ANALYTICAL USES OF CHARGE-TRANSFER COMPLEXATION: SPECTROPHOTOMETRIC METHOD FOR IODIDE IN WATER,
Edgewood Arsenal, Md.
E. J. Poziomek, and D. W. Reger.
Analytica Chimica Acta, Vol, 58, No. 2, p 459-462, February 1972. 2 tab, 15 ref.

Descriptors: *Spectrophotometry, *Iodides, *Aqueous solutions, *Water analysis, Chemical analysis, Iodine, Pollutant identification, Chlorides, Bromides, Anions, Sodium chloride, Methodology, Saline water, Analytical techniques.
Identifiers: *Charge-transfer complexation, 4-cyano-1-methylpyridinium iodide, Perchlorates, Ultraviolet absorption, Chemical interference, Sodium bromide, Sodium perchlorate, Absorbance.

Iodide content can be determined in water samples containing chloride, bromide and/or perchlorate anions by a spectrophotometric examination of the charge-transfer transition of pyridinium iodides. The ultraviolet absorption of the 4-cyano-1-methylpyridinium iodide charge-transfer complex in the region 340-350 nm is used as a measure of the iodide. Analyses of distilled water, USP saline, and aqueous sodium chloride solutions indicated that iodide could be determined within a range of 0.01-1.00 percent in the presence of the aforementioned anions. This spectrometric procedure provides a simple method for the determination of iodide over a wide concentration range in aqueous solutions containing other halides and/or perchlorate. Adaptation of this method to other applications requires that the particular system be checked with the pyridinium perchlorate to insure that no reactant is present which gives products with absorption in the 340-350 nm region. The analysis may also be extended for use in non-aqueous solvents. In that case the charge-transfer absorption is found at longer wavelengths and is usually more intense. Depending on particular needs, a mixed water-organic solvent system could also be employed. (Long-Battelle)
W72-13792

SPECTROPHOTOMETRIC DETERMINATION OF TRACE QUANTITIES OF IRON (III) BY AN EXCHANGE REACTION WITH METAL ACETYLACETONATES,
Assiut Univ. (Egypt). Dept. of Chemistry.
M. M. Aly.
Analytica Chimica Acta, Vol. 58, No. 2, p 467-469, February 1972. 1 fig, 5 ref.

Descriptors: *Spectrophotometry, *Iron, Chemical reactions, Alkali metals, Colorimetry, Heavy metals, Cations, Color reactions, Trace elements, Methodology, Analytical techniques, Anions, Pollutant identification, Chlorides, Magnesium compounds, Nitrates, Sulfates, Fluorides, Ammonium compounds, Potassium, Calcium, Magnesium, Strontium, Zinc, Lead, Manganese, Nickel, Aluminum, Mercury, Sodium.
Identifiers: *Exchange reactions, *Acetylacetonates, *Chemical interference, Dioxane, Chloroform, Absorbance, Metal complexes, Zinc compounds, Barium, Ammonium sulfate.

In the spectrophotometric determination of trace quantities of iron (III) by an exchange reaction with metal acetylacetonates, aliquots of iron solution are added to 3.0 ml of zinc or magnesium acetylacetonate in 7.0 ml of dioxane or chloroform. The resulting color change is measured with a spectrophotometer set at 440 nm. The colorimetric reaction resulted from an instantaneous ion exchange between iron and the metal in magnesium or zinc acetylacetonate. Presumably the occurrence of the reaction is due to the greater stability of the iron acetylacetonate complex as compared with that of magnesium or zinc. Chemical interference was not observed when ammonium ions, Na, K, Mg, Ca, Sr, Ba, Zn, Pb, Mn, Ni, Al or Hg (II) were present in the iron solution up to 0.05 M. Copper did not interfere when the Cu-Fe ration was less than 30. Chromium did not interfere in the chloroform technique due to the insolubility of chromium salts in chloroform; it did interfere in the dioxane method, particularly when this method was applied to a highly acidic aqueous solution and the prepared sample was left more than 1 h before the absorbance was measured. Chloride, nitrate, and sulphate had no effect on the measurements but fluoride interfered. The chloroform technique was found to be more useful since inorganic ions do not interfere in the solutions containing chloroform. (Long-Battelle)
W72-13793

VOLTAMMETRY IN METHANOL, ETHANOL, AND SULFOLANE AS SOLVENTS,
Pittsburgh Univ., Pa. Dept. of Chemistry.
J. F. Coetzee, and J. M. Simon.
Analytical Chemistry, Vol. 44, No. 7, p 1129-1133, June 1972. 5 tab, 18 ref.

Descriptors: *Alkali metals, *Cations, Ions, Alcohols, Polarographic analysis, Measurement, Zinc, Manganese, Cobalt, Copper, Electrodes, Sodium, Potassium, Cesium, Electrical properties.
Identifiers: *Barium, *Voltammetry, *Organic solvents, Methanol, Ethanol, Sulfolane, Acetonitrile, Perchlorates, Samarium, Lanthanum, Lithium, Rubidium.

Polarographic half-wave potentials were measured for alkali metals, and barium ions in the solvents methanol, ethanol, sulfolane, and acetonitrile. Measurements in sulfolane were made with a 3-electrode polarograph, cell, salt bridge, silver reference electrode (AgRE), and rotated platinum microelectrode; those in methanol and ethanol were made with a Coleman 3-512 fiber tip SCE instead of the AgRE. The results were expressed as reduction potentials. For methanol, reliable standard potentials are available, and the sets of half-wave and standard potentials are reasonably consistent. The half-wave potential of barium is solvent-dependent; barium was the only higher charge type cation giving reversible waves in several solvents for which solvation was most likely to be predominantly electrostatic. In water, methanol, ethanol, sulfolane, and acetonitrile as solvents, the half-wave potential of barium was more positive that that of potassium by 0.22, 0.18, 0.18, 0.24, and 0.33 volt, respectively. It would appear that the 'electrostatic' solvation of the barium ion, relative to that of the potassium ion, is weaker in water than in the alcohols. (Long-Battelle)
W72-13794

SENSITIVE FLUORESCENCE METHOD FOR THE DETERMINATION OF CHLOROPHYLL A/CHLOROPHYLL B RATIOS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
N. K. Boardman, and S. W. Thorne.
Biochimica et Biophysica Acta, Vol 253, No 1, p 222-231, November 2, 1971. 8 fig, 1 tab, 13 ref.

Descriptors: *Plant tissues, *Chlorophyll, Plant pigments, Separation techniques, Spectrophotometry, Fluorescence, Chromatography, Beans, Temperature, Nitrogen, Methodology, Chemical analysis, Solvent extractions.
Identifiers: *Chlorophyll a, *Chlorophyll b, Spectrofluorimetry, Absorbance, Spinach, Accuracy, Spinacia oleracea, Phaseolus vulgaris, Pheophytin a, Pheophytin b, Protochlorophyll, Sensitivity, Organic solvents, Sample preparation.

Sensitive spectrofluorimetric methods have been developed for the accurate estimation of chlorophyll a/chlorophyll b ratios in extracts of whole leaves or isolated plastids, where the amount of chlorophyll b (chl b) is low compared with that of chlorophyll a (chl a). Chl a and b were extracted from spinach leaves (Spinacia oleracea), and protochlorophyll from dark-grown bean plants (Phaseolus vulgaris). After all extracts were purified by repeated chromatography, pheophytin a and b were obtained by acidifying purified solutions of chl a and b. Pigment purity was checked by spectral scans at 350-750 nm and absorbance ratios obtained. For the determination of chl a/chl b ratios by the ethanol method, the tissue was ground in ethanol, the extract clarified by centrifugation and diluted. With the ether method, the tissue was ground in acetone and the pigments transferred to an ether solution which was dried over anhydrous sodium sulfate and diluted. After determining the fluorescence emission and excitation spectra of chl a and b in diethyl ether at room temperature using a specially equipped fluorescence spectrometer, the chl a/chl b ratios were determined from the relative fluorescence amplitudes at 666 nm (maximum of chl a) and 646 nm (maximum of chl b). Chl a/chl b ratios were determined on as little as 0.5-1 microgram of chlorophyll, but satisfactory results can be obtained with 0.2 microgram of chlorophyll. The ethanol method at liquid-nitrogen temperature is suitable for measuring chl a/chl b ratios of up to 100 with an accuracy of better than plus or minus 5 percent. The ether method at room temperature covers the range up to a chl a/chl b ratio of 60, with an accuracy of plus or minus 5 percent. The accuracy of the methods described is dependent on the resolution of the emission and excitation monochromators. The measurements used were an excitation half bandwidth of plus or minus 1.5 nm and an emission half bandwidth of plus or minus 1.0 nm. (Byrd-Battelle)
W72-13796

A NEW LIGHT TRAP FOR PLANKTON,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
D. A. Jones.
In: Fourth European Marine Biology Symposium, September 14 and 20 1969, Bangor, Wales, 1971 p 487-493. 2 fig, 2 tab, 8 ref.

Descriptors: *Zooplankton, *Sampling, *Equipment, Light, Automation, Nets, Amphipoda, Annelids, Invertebrates, Larvae, Crustaceans.
Identifiers: *Light trap, Euphausiids, Phaeocystis, Macroinvertebrates, Arthropods, Littorina littorea, Calliopius rathkei, Orchomenella commensalis, Praunus flexuosus, Schistomysis spiritus, Temora longicornis, Paracalanus, Pseudocalanus, Acartia clausii, Centropages hamatus, Carcinus meanus, Balanus, Sagitta elegans, Pleurobrachia pileus, Atylus swammerdami, Orchestia gammerella, Bathyporeia guilliamsoniana, Meganictyphanes norvegica, Pagurus bernhardus, Nyctiphanes couchii, Corophium volutator, Palaemon serratus.

A light trap for catching plankton at night is designed to run automatically and retains the catch for removal at the convenience of the operator. It consists of an electric light source enclosed in a wire frame covered with plankton netting. Zooplankton are attracted by the light beam and enter a conical entrance at the base. The organisms cannot excape as they encounter difficulty in finding the exit when sinking downward with the onset of daylight. The light is shaded so plankton will not be attracted to the side of the trap. A sleeve and collecting bucket on the lower rim of the trap facilitate removal of the catch. In tests of the apparatus, the differences in zooplankton caught when the light trap was switched on and off indicate an increased efficiency of 94 percent when operational. Results compared favorably with those using a 0.5-m townet, with a mean catch of 44,000 zooplankton individuals per night. About 4 percent of the catch was plankton organisms other than the photopositive zooplankton for which the trap was intended. (Mortland-Battelle)
W72-13797

A STUDY OF LIGHT ATTENUATION IN MONTEREY BAY, CALIFORNIA,
Naval Postgraduate School, Monterey, Calif.
T. W. Crews.
Master's Thesis, September 1971. 149 p, 52 fig, 10 tab, 26 ref.

Descriptors: *Sea water, *Instrumentation, *On-site tests, *Physical properties, *Chemical properties, *California, Attenuation, Light, Oxygen, Phosphates, Sediments, Suspended solids, Salinity, Density, Methodology, Sampling, Absorption, Oceans, Upwelling, Phosphorus, Water temperature, Telemetry, Optical properties, Oceanography.
Identifiers: *Monterey Bay (Calif), Beam transmission, Coulter counter, Lasers, Particulate matter, Pycnocline.

A single ocean station was occupied (using an oceanographic vessel) for 27 hours during the Upwelling Period in Monterey Bay, California in order to find the qualitative relations between alpha and temperature, salinity, density, oxygen and phosphate concentrations, and particulate matter at a single site over an extended period of time, and to make comparisons with previous local studies. A Marine Advisors' Model C-2 Beam Transmissometer (alpha meter) which compares favorably with a Scripps folded path transmissometer was used to study light attenuation. Other instruments included a Bissett-Berman Telemetering Salinity-Temperature-Depth-Sound Velocity System Model 9040 which can be set in various modes of operation depending on the environmental conditions measured; a Sippican Expendable Bathythermograph System with an accuracy of plus or nimus 0.2 degree C and plus or minus 2 percent or 15 feet, whichever is greater; and a Model T 15-Channel Coulter Counter for particulate matter analysis. A total of 48 casts were made during the 27-hr period with all measurements being taken at the same depths. It was found that the vertical distributions of the oceanographic parameters studied are dependent on both the seasonal conditions and geographical location. The largest concentration of suspended particles was found in the upper 10-15 m of the water column where most of the light attenuation occurred. The largest attenuation gradient was found in the pycnocline. A linear relation was suggested between the attenuation coefficient and the cumulative projected cross-sectional area of the particles. (Long-Battelle)
W72-13798

SALMONELLA.
Defense Documentation Center, Alexandria, Va.
For primary bibliographic entry see Field 05C.
W72-13800

VERSATILE COLORIMETRIC COULOMETER,
Honeywell Research Center, Hopkins, Minn.
For primary bibliographic entry see Field 02K.
W72-13802

SIMPLE DEVICE FOR COMPENSATION OF BROAD-BAND ABSORPTION INTERFERENCE IN FLAMELESS ATOMIC ABSORPTION DETERMINATION OF MERCURY,
Jefferson Chemical Co., Inc., Austin, Tex. Austin Labs.
R. L. Windham.

Descriptors: *Mercury, Instrumentation, Laboratory equipment, Pollutant identification, Water pollution sources, Heavy metals, Methodology, Chemical analysis, *Spectrophotometry.
Identifiers: *Chemical interference, Flameless atomic absorption spectrophotometry, Absorbance, Reliability, Palladium chloride, Recovery.

Palladium chloride on a glass wool mercury absorber attached to a cycling flameless vaporization system was used to compensate for absorption interference in the flameless atomic absorption technique for the determination of mercury. The palladium chloride absorber was prepared by dipping a small plug of glass wool into a 1 percent solution of palladium chloride. Mercury was vaporized, allowed to equilibrate for 1 minute using a peristalter pump, and the absorbance measured at the peak maximum. Mercury was determined in samples containing deionized water, nitric acid, mercury standard of 0.10 microgram, and one or none of the following background-producing compounds: acetone, methyl isobutyl ketone, HCl. Erroneously high absorbance peaks were obtained for all of the above solutions. When mercury was absorbed from the vapor streams by palladium chloride on glass wool, the absorbance decreased by 0.06 absorbance unit, which corresponds to the 0.01 microgram Hg present and to the absorbance of the test sample which had no organic contaminants. The lifetime of the PdC12 absorber is dependent on sample load, but as many as ten samples have been observed to cause no decrease in absorbing ability. This method for background compensation is convenient for mercury determinations whenever a broad-band background interference is present or suspected. It appears to be reliable and specific for mercury. (Long-Battelle)
W72-13803

NEUTRON-ACTIVATION DETERMINATION OF VANADIUM IN OILS AND CATALYSTS,
Instituto de Asuntos Nucleares, Bogota (Colombia).
A. Arroyo, and D. Brune.
Mikrochimica Acta, No 2, p 239-241, March 1972. 2 ref.

Descriptors: *Vanadium, *Oil, *Neutron activation analysis, *Catalysts, Trace elements, Chemical analysis.
Identifiers: Crude oil, Petroleum residues, Vanadium radioisotopes, Oil residues, Chemical interference, V-52, Al-28, Sensitivity, Detection limits, S-37, Sample preparation.

Vanadium in crude and residual oils and in catalysts at concentration levels of 0.2-200 and 400-2000 ppm, respectively, has been determined by means of neutron-activation analysis. The samples were irradiated for four minutes in a thermal flux of 2 giga n/sq mm/sec in a Lockheed reactor followed by a decay period of three minutes. The 1.44 MeV gamma-ray of V-52 was measured with a NaI (Tl) crystal connected to a pulse-height analyzer. Samples were measured for a period of one minute each. Interference by the nuclides Al-28 and S-37 was stripped off; however, the activities of those nuclides limited the degree of sensitivity of V. A precision study on the heavy gas oil containing 0.20 ppm vanadium gave a precision of about 5 percent. The limits of detection of vanadium in oils and in catalysts by the instrumenal technique are estimated to be 0.01 and 10 ppm, respectively. Using this technique, five samples, including the standard can be analyzed in less than 15 minutes. (Snyder-Battelle)
W72-13804

MICRODETERMINATION OF CARBON, HYDROGEN, NITROGEN AND OXYGEN IN PETROLEUM COMPOUNDS WITH AN AUTOMATIC ELEMENTAL ANALYZER,
Sun Oil Co., Marcus Hook, Pa.
A. J. Smith, G. Myers, Jr., and W. C. Shaner, Jr.
Mikrochimica Acta, No 2, p 217-222, March 1972. 1 fig, 5 tab, 8 ref.

Descriptors: *Oil, *Chemical analysis, Oxygen, Nitrogen, Carbon, Hydrogen, Evaluation, Methodology, Organic compounds, Automation, Instrumentation, Laboratory equipment, Analytical techniques.
Identifiers: *Elemental analyzer, *Petroleum products, *Chemical elements, Hydrocarbons, Anthracene, Asphaltenes, Crude oil.

The applicability of the Perkin-Elmer Elemental Analyzer has been evaluated for the analysis of carbon, hydrogen, nitrogen and oxygen in typical petroleum compounds. Comparison of the Elemental Analyzer results were made with carbon and hydrogen analyses by the Pregl method, oxygen by the Unterzaucher method, and nitrogen results from the automated micro Dumas Analyzer. The results obtained by the automated method were found comparable to those obtained by conventional methods. The automated method was found useful for the analysis of nitrogen in petroleum samples ranging from 0.05 to 0.1 percent N. Samples of transformer oil containing known amounts of added phenol were analyzed for oxygen at the 0.2-1.0 percent oxygen level. (Snyder-Battelle)
W72-13805

TITRIMETRIC DETERMINATION OF TRACE SULFUR IN PETROLEUM USING A LEAD ION SELECTIVE ELECTRODE,
Sun Oil Co., Marcus Hook, Pa.
R. N. Heistand, and C. T. Blake.
Mikrochimica Acta, No 2, p 212-216, March 1972. 2 fig, 2 tab, 8 ref.

Descriptors: *Sulfur, *Volumetric analysis, Trace elements, Chemical analysis, Pollutant identification, Methodology.
Identifiers: *Ion selective electrodes, *Petroleum products, *Lead electrodes, Precision, Accuracy.

A rapid, simple method is described for the determination of trace total sulfur in petroleum distillates. The petroleum sample is combusted using an oxyhydrogen burner. The combustion products are collected in 50 ml of absorber solution containing 10 mg of sodium nitrite and 0.444 mg of sodium sulfate. The excess nitrite is destroyed by boiling. After cooling, sufficient 1,4-dioxane is added to make a 50 volume percent solution for the titration. The titration is carried out using an anodic 0.5 microamp polarizing current through a lead ion-selective electrode with standardized (0.0025 M) lead perchlorate as the titrant. The potential break at the endpoint is determined graphically from the titration curve and related to the total sulfur in the petroleum sample. The precision and accuracy of this method are not significantly different than the turbid metric method and it is not limited by the amount of sulfur produced. (Snyder-Battelle)
W72-13806

SOLVENT EXTRACTION AND SEPARATION OF ZIRCONIUM, NIOBIUM AND TANTALUM

BY 2-CARBETHOXY-5-HYDROXY-1- (4--TOLYL)-4-PYRIDONE,
Zagreb Univ. (Yugoslavia). Inst. of Inorganic and Analytical Chemistry.
M. Janko, and M. J. Herak.
Mikrochimica Acta, No 2, p 198-207, March 1972. 9 fig, 1 tab, 7 ref.

Descriptors: *Solvent extractions, *Separation techniques, Organic compounds, Radioisotopes, Organic acids, Aqueous solutions.
Identifiers: *2-Carbethoxy-5-hydroxy-1- (4-tolyl)-4-pyridone, *Zirconium, *Niobium, *Tantalum, Oxalic acid, Organic solvents, Ta-182, Scintillation counting, Efficiency, Zr-95, Nb-95, Zirconium radioisotopes, Niobium radioisotopes, Tantalum radioisotopes.

The metals zirconium, niobium, and tantalum were extracted from oxalic and hydrofluoric acid solutions by 2-carbethoxy-5-hydroxy-1- (4-tolyl)-4-pyridone (HA) dissolved in chloroform, in the presence or absence of mineral acids. Extraction mechanisms for the separation of niobium from fluoride solutions and zirconium from oxalate solutions were proposed from distribution ratios determined by using radionuclides. It was not possible to show a mechanism for the extraction of tantalum from fluoride by this method. The separation of zirconium and niobium from oxalate and fluoride solutions and the separation of tantalum and niobium from fluoride solutions as well as back-extractions by hydrofluoric and oxalic acids were described. The results indicated that HA is an efficient extractant for the metals in both oxalate and fluoride systems and that the efficiency of extraction decreased in the sequence: tantalum, niobium, zirconium. (Long-Battelle)
W72-13807

A COMPUTERIZED SYSTEM FOR STORING, RETRIEVING, AND CORRELATING NMR DATA,
Hercules Research Center, Wilmington, Del.
For primary bibliographic entry see Field 07C.
W72-13808

DDT: INHIBITION OF SODIUM CHLORIDE TOLERANCE BY THE BLUE-GREEN ALGA ANACYSTIS NIDULANS,
Wisconsin Univ., Madison. Dept. of Entomology.
For primary bibliographic entry see Field 05C.
W72-13809

OIL POLLUTION: PERSISTENCE AND DEGRADATION OF SPILLED FUEL OIL,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05B.
W72-13810

SANDWICH KBR DISK FOR SCANNING VOLATILE PESTICIDES,
Agricultural Research Service, Beltsville, Md. Entomology Research Div.
P. A. Giang.
Analytical Chemistry, Vol 44, No 7, p 1340-1342, June 1972. 1 fig, 1 ref.

Descriptors: *Pesticides, *Instrumentation, *Pollutant identification, *Volatility, Analytical techniques, Infrared radiation, Laboratory equipment, Pesticide residues, Methodology, Phosphothioate pesticides, Phenolic pesticides, Chlorinated hydrocarbon pesticides, Halogenated pesticides.
Identifiers: *Infrared spectroscopy, *Sandwich KBr Disk procedure, Detection, Dichlorvos, Potassium bromide, Malathion, Schradan, Sample preparation.

An excellent infrared spectrum for volatile pesticides could be obtained by placing samples on a freshly prepared KBr disk in the barrel of a Wilks Mini-Press and covering this disk with another KBr disk. If the sample of pesticide is a solution, the solvent must be evaporated completely after the solution is mixed with the KBr in the agate mortar and before it is transferred into the depression in the disk. Therefore, a low-boiling solvent such as spectranalyzed methylene chloride or pentane is preferred in making the sample solution. In subsequent experiments, it was found that this disk sandwich procedure for volatile chemicals can also be used with minute amounts of certain samples of pesticidal residues. (Long-Battelle)
W72-13811

2-AMINO-4-METHYLTHIAZOLE AS A REAGENT FOR THE GRAVIMETRIC DETERMINATION AND EXTRACTION OF MERCURY (II),
Roorkee Univ. (India). Dept. of Chemistry.
S. N. Tandon, P. K. Srivastava, and S. R. Joshi.
Analytica Chimica Acta, Vol 59, No 2, p 311-315, April 1972. 2 fig, 2 tab, 9 ref.

Descriptors: *Mercury, *Aqueous solutions, *Solvent extractions, Chemical analysis, Gold, Trace elements, Solubility, Anions, Cations, Separation techniques, Gravimetric analysis, Chelation, Heavy metals, Pollutant identification, Gold radioisotopes.
Identifiers: *2-Amino-4-methylthiazole, Hg-203, Ag-110m, Au-198, Precision, Silver radioisotopes, Mercury radioisotopes, Silver, Chemical interference, Complexation, Organic solvents.

High aqueous solubility and selectivity make 2-amino-4-methylthiazole a good reagent for the gravimetric determination and extraction of mercury (II). To samples containing 20-150 mg of Hg (II), such as Hg-203 in Hg (NO3)2, an aqueous 0.025 M solution of the reagent was added in slight stoichiometric excess, followed by a pH 9.2 buffer. The resulting precipitate was filtered, washed, dried at 90-100 C for 1 h, and weighed as HgC4H4N2S. The error was within plus or minus one percent at a relative standard deviation of 0.67 percent. No interference was caused by fluoride, oxalate, citrate, and tartrate, but iodide, cyanide, sulphide, thiosulphate, and EDTA interfered. Ag (I) and Au (III) were found to interfere with complexation but, after testing the best solvents for extraction, it was found that above pH 8.4 the mercury complex can be extracted quantitatively into amyl acetate or di-isopropyl ether whereas silver and gold complexes show poor or negligible extraction. The use of radioisotopes of the metals allowed precision in determinations of degrees of complexation and extraction. Radiometric and thermal analyses were done to determine the pH of maximum precipitation and heat stability of the complex. (Mackan-Battelle)
W72-13812

GROWTH OF ENDOMYCOPSIS LIPOLYTICA ON HYDROCARBONS,
Regional Research Lab., Jorhat (India). Biochemistry Div.
J. N. Nigam, B. K. Lonsane, K. Vadalkar, H. D. Singh, and J. N. Baruah.
Journal of General and Applied Microbiology, Vol 17, No 6, p 433-437, December 1971. 3 tab, 10 ref.

Descriptors: *Yeasts, *Oil fields, Isolation, Cultures, Biomass, Soil fungi, Separation techniques.
Identifiers: *Endomycopsis lipolytica, *Substrate utilization, *Aliphatic hydrocarbons, Alkanes, Petroleum products, Enrichment, Biochemical tests, India, Octadecane, Eiconsane, Undecane, Decane, Hendecane, Hexadecane, Nonadecane, Petroleum fractions, Gas oil, Diesel oil, White kerosene, Dodecane, Tridecane, Tetradecane, Pentadecane, Heptadecane.

The ability of the yeast Endomycopsis lipolytica to grow on hydrocarbons was assessed using ten strains of this ascosporogenous yeast which were isolated from the oil fields of Assam in India. Biomass yield from gas-oil, diesel oil, and white kerosene by all the strains were studied in a shake flask. Fermentation studies were carried out in a 3-liter fermenter at 10 percent gas-oil concentration, and growth was measured as the amount of ammonium hydroxide necessary to maintain operational pH. The growth characteristics of the 10 strains of yeast on various petroleum fractions and n-alkanes are reported as well as biochemical characteristics such as pellicle formation, splitting of arbutin, and litmus milk tests. (Long-Battelle)
W72-13817

GROWTH OF SALMONELLA TYPHIMURIUM IN SKIM MILK CONCENTRATES,
Wisconsin Univ., Madison. Food Research Inst.
C. A. Dega, J. M. Goepfert, and C. H. Amundson.
Applied Microbiology, Vol 23, No 1, p 82-87, January 1972. 4 fig, 1 tab, 10 ref.

Descriptors: *Milk, *Growth, Coliforms, *Pressure, Enteric bacteria, Growth rates, Temperature, E. coli, Measurement, Water pollution sources, Cultures, Environmental effects, Atmospheric pressure, *Salmonella.
Identifiers: *Salmonella typhimurium, Characterization, Culture media.

An investigation was made of the influence of various levels of skim milk solids and temperature on the duration of lag phase, growth rate, and extent of growth of Salmonella typhimurium. The effect on growth of salmonellae (and a strain of Escherichia coli) of reduced pressure at a constant solids level and under conditions simulating vacuum condensation of skim milk was also studied. S. typhimurium grew when inoculated into skim milk solutions ranging from 10 to 60 percent solids and over a temperature range of 23 to 44 C. At 10 to 12 C, growth was evident only in the 10 percent skim milk. As the total solids level was increased or incubation temperature was deviated from the optimum, or both, there was an increase in the lag phase and generation time of salmonellae. A lower cell population resulted. The generation time at 37 C of S. typhimurium incumbated at atmospheric pressure was approximately one-half that in skim milk concentrates held under reduced pressure. A slightly longer lag phase and lower cell yield characterized the growth under reduced pressure. Concentration of skim milk had little or no effect on viability of salmonellae or E. coli when the vapor temperature in the vacuum pan was below the maximum growth temperature for salmonellae. Increasing the vapor temperature to 48 C caused a two-log reduction in viable organisms during the concentrating period (65 min). (Long-Battelle)
W72-13818

A CONTINUOUSLY MONITORED RESPIRATION CHAMBER FOR FISH,
Antioch Coll., Yellow Springs, Ohio.
J. O'Hara.
Water Research, Vol 5, p 143-145, 1971. 1 fig, 1 tab, 6 ref. WP-01281-01.

Descriptors: *Oxygen requirements, *Fish physiology, *Laboratory equipment, *Research equipment, Oxygen, Dissolved oxygen, Biochemical oxygen demand, Respiration, Bioassay, Environmental effects, Sunfishes.
Identifiers: *Respirometers, Oxygen utilization, Respiration rates.

Oxygen utilization by fish can be used as a measure of the general metabolic activity of the organism and the influence of environmental variables and stresses can be indicated by how they alter this metabolic rate. Determination of recovery periods from stress as well as establishing fairly precise levels of no stress effect depend upon establishing a continuously monitored oxygen utilization rate. An apparatus that provides a con-

tinuous recording of the respiration rates of fish is described. The respirometer uses the flowing water technique and provides extremely reliable determinations of respiration rates to be made on small to medium size fish. Ten bluegills (Lepomis macrochirus) were tested to determine the repeatability of measurements using this apparatus. The results show close values of oxygen utilization by fish in this size class when tested at 25C. (Svensson-Washington)
W72-13872

METHOD AND MEANS FOR DETECTING COLIFORM BACTERIA IN WATER,
Hach Chemical Co., Ames, Iowa. (Assignee)
C. C. Hach.
U. S. Patent No 3,553,082, 4 p, 3 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 882, No 1, p 292, January 5, 1971.

Descriptors: *Patents, *Bacteria, *Indicators, Biological pollutants, *Coliforms, *Bioindicators, *Pathogenic bacteria, *Pollutant identification, Water pollution, Water pollution sources.

The test liquid sample and a nutrient medium are introduced into a chamber having a separator so that any gas developed from fermentation by bacteria may be collected. The nutrient medium may be lactose broth or brilliant green lactose bile broth solution. The claim is that these procedures take less time than do the U.S. Public Health Service Drinking Water Standards tests. (Sinha-OEIS)
W72-13881

MARIN ENVIRONMENTAL QUALITY, SUGGESTED RESEARCH PROGRAMS FOR UNDERSTANDING MAN'S EFFECT ON THE OCEANS.
National Academy of Sciences-National Research Council, Washington, D.C. Committee on Ocean Sciences.

National Academy of Sciences, Washington, D.C., August 9-13, 1971. 119 p, 1 fig, 9 tab, 71 ref.

Descriptors: *Environmental effects, *Pollutant identification, *Path of pollutants, Water pollution sources, *Dispersion, *Geochemistry, *Biological properties, *Transfer, Elements (Chemical), Disposal, Water pollution effects, Aquatic organisms.

The Ocean Science Committee of the Ocean Affairs Board conducted a workshop to examine the problems related to its marine environmental quality program. The problem areas selected for study included: identification of major pollutants, their sources and input rates; delineation of processes affecting the dispersal of these pollutants; the geochemical and biological transfer of critical elements or compounds in the ocean; establishing the effects of pollutants on living organisms; and identification of the sites of final deposition of specific elements and compounds in the ocean environment. Results of these investigations are presented and recommendations are made. (Ensign-PAI)
W72-13903

U234/U238 DISEQUILIBRIUM IN GROUNDWATERS OF CENTRAL TEXAS,
Rice Univ., Houston, Tex. Dept. of Geology.
For primary bibliographic entry see Field 05B.
W72-13971

THE CONCENTRATIONS OF CADMIUM, COPPER, IRON, MANGANESE, MOLYBDENUM, NICKEL, VANADIUM AND ZINC IN PART OF THE TROPICAL NORTHEAST ATLANTIC OCEAN,
Liverpool Univ., (England). Dept. of Oceanography.
J. P. Riley, and D. Taylor.
Deep-Sea Research, Vol. 19, p 307-317, 1972. 2 fig, 4 tab, 10 ref.

Descriptors: Elements (Chemical), *Atlantic Ocean, *Assay, Water sampling, Laboratory tests, Analytical techniques, Chelation, Ion exchange, Colorimetry, *Spectrophotometry, Distribution, *Cadmium, Copper, *Iron, *Manganese, Molybdenum, *Nickel, Vanadium, Zinc, *Trace elements.

Determinations of cadmium, copper, iron, manganese, molybdenum, nickel, vanadium, and zinc have been carried out on water samples from the tropical north-east Atlantic Ocean, using a chelating ion-exchange concentration method followed by atomic absorption spectrophotometry, or for molybdenum and vanadium by colorimetry. The results indicate that cadmium, iron, manganese, and nickel are relatively uniformly distributed in this area, whereas molybdenum, vanadium, zinc, and, to some extent, copper show larger variations of a random nature. (Houser-ORNL)
W72-13985

IODINE IN THE DEEP WATER OF THE OCEAN,
Hokkaido Univ., Sapporo (Japan). Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W72-13986

PERMISSIBLE ACTIVITY DISCHARGE INTO RECEIVING WATERS THROUGH RADIOACTIVE WASTE WATER FROM NUCLEAR POWER PLANTS (ZULASSIGE AKTIVITATSEINLEITUNG IN VORFLUTER DURCH RADIOAKTIVE ABWASSER AUS KERNKRAFTWERKEN),
P. G. Brunner.
Wasser und Boden, Vol. 5, No. 4, p 124-126, 1971. 2 fig, 4 ref.

Descriptors: *Nuclear powerplants, *Effluents, *Discharge, *Regulation, Administrative agencies, Management, Monitoring, Radioisotopes, Surface waters, Water pollution control, Water pollution sources.
Identifiers: Radiation safety, Radiation control.

Details are given of the future consumption of electric energy and of the future installed electric power from nuclear power plants. Based thereon, the permissible radioactive discharge per 100 MWe into waters is determined to be 1.5 Ci/a, except T, for a total power of nuclear power plants of 100,000 MWe. Considering the capacity of decontamination plants the permissible activity discharge per 100 MWe can be provisionally established to be 1 Ci/a. (House
W72-13987

RADIATION DATA, (SECTION II - WATER).
Environmental Protection Agency, Washington, D.C. Office of Water Programs.

Radiation Data and Reports, Vol. 13, No. 7, p 403-405, July 1972. 1 tab, 6 ref.

Descriptors: *Radioactivity, *Survey, *Assay, *Measurement, *Sampling, Analytical techniques, Data collections, Fallout, Public health, Regulation, Water pollution, Water pollution sources, Radioisotopes.
Identifiers: *Surveillance program.

In the section on water, data are presented on the gross alpha and beta radioactivity (suspended solids and dissolved solids) for samples collected the following ten rivers during November 1971: Clinch River, Colorado River, Dolores River, Mississippi River, Ohio River, Roanoke River, San Miguel River, St. Lawrence River, White River and Yampa River. (Houser-ORNL)
W72-13988

RADIATION DATA, (SECTION II - WATER).
Environmental Protection Agency, Washington, D.C. Office of Water Programs.

Available from Sup Doc, U.S. Printing Office, Wash., D.C., 20402, for $0.50/copy. Radiation Data and Reports, Vol. 13, No. 6, p 360-366, June 1972. 2 fig, 6 tab, 8 ref.

Descriptors: *Radioactivity, *Assay, *Measurement, Food chains, Milk, Iodine, *Strontium, Cesium, Barium, Water, Water pollution, Water pollution sources, Nuclear explosions, Fallout, *Sampling, Data collection, Public health, Governments, *California, *Sewage.
Identifiers: Surveillance program.

In the water section, data are presented on the gross alpha and beta radioactivity (suspended and dissolved solids) for samples collected from seventeen rivers during October 1971. Strontium-90 data results are given for samples collected and composited from 26 rivers during January - March 1971. For Caliornia data are reported on the monthly average beta radioactivity for samples of domestic waters for the period January - December 1970. Other data for California in 1970 include: radiomidide concentrations; gross radioactivity in sewage samples; and comparison of radioactivity in domestic water and sewage. (Howser-ORNL)
W72-13989

STRONTIUM-90 AND CESIUM-137 IN CANNED SEAFOOD, TAIWAN, REPUBLIC OF CHINA, 1970-1971,
National Tsing Hua Univ., Hsinchu (Taiwan). Inst. of Physics.
P. S. Weng, and A. P. Liu.
Available from U. S. Sup Doc, Gov. Printing Office, Washington, D.C., 20482, 50 cents per copy. Radiological Health Data and Reports, Vol 12, No 12, p 615-616, December 1971. 1 fig, 1 tab.

Descriptors: *Radioisotopes, *Strontium, *Cesium, *Assay, *Aquatic animals, *Fish, Food, Food habits, Food chains, Aquatic populations, Pollutants, Path of pollutants, Food processing industry.
Identifiers: Seaweed, Canned seafood, *Taiwan (China).

Since 1970, canned seafood available on the market has been regularly monitored for strontium-90 and cesium-137 radioactivity. Tsing Hua University analyzed the samples by means of standard radiochemical methods and beta-particle counting in a low, background counting system. The samples included canned seafood from Europe, North America, Japan, and Taiwan as well as wide variety of seafood extending from sardines to seaweeds. (Houser-ORNL)
W72-13990

HANFORD ATOMIC PRODUCTS OPERATION, JANUARY-DECEMBER 1969.
Battelle Memorial Inst., Richland, Wash.
For primary bibliographic entry see Field 05B.
W72-13991

A STUDY OF PHOSPHATE INDUCED ALGAL GROWTH IN ORDER TO SUPPRESS OR ELIMINATE THIS PHENOMENON,
New Mexico State Univ., University Park. Water Resources Research Inst.
N. E. Vanderborgh, and A. G. Buyers.
Available from the National Technical Information Service as PB-212 026, $3.00 in paper copy, $0.95 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Completion Report 003, June 1972, 35 p, 9 fig, 7 tab, 22 ref. OWRR A-035-NMEX (1).

Descriptors: *Algal control, *Phosphates, *Algal nutrients, *Chlorella, Algae, *Eutrophication, New Mexico, Biodegradation.

Identifiers: *Algal growth, *Radioisotope P32, Sodium pyrophosphate, Rio Grande Valley.

The kinetics of the radioactive isotope P32 uptake by the fresh water algae, chlorella, were investigated in soil-water cultures, natural systems, and synthetic culture media. Laboratory investigations were conducted at pH values of 4, 7 and 10, at a constant temperature 20 plus or minus 2C. Portions of reagent grade sodium pyrophosphate were irradiated with a fast neutron flux converting a portion of the sample into the radioisot0pe P32. (P32 emits a 1.7 Mev beta with a half-life of 14.31 days.) Tagging was done at a rate sufficient to produce an activity of 0.03 microcuries/gram. Solutions were then prepared containing the tagged pyrophosphate and used to spike chlorella cultures. The uptake of the isotope was then monitored as a function of time. After various times the cultures were sampled, filtered and counted for P32 activity. Results indicated that the kinetic interpretation of P32 uptake must allow for first order kinetics with respect to P32 at a pH of 10, and a second order kinetic scheme at pH 7 and 4. This evidence indicated that algal systems only utilize phosphorus in the orthophosphate form. Phosphorus exchange rates with soil and information about degradation pathways are included. Two experiments, one with an oxygen rich environment and the second with a carbon dioxide rich environment, were carried out with sodium pyrophosphate-chlorella, soil-water and chemical cultures. In the oxygen experiment P32 removal was eliminated in the chemical cultures and removal was slowed for the soil-water cultures. C02 enrichment greatly accelerated the removal. (Creel-NMex State)
W72-13992

A REVIEW OF PESTICIDE MONITORING PROGRAMS IN CALIFORNIA.
California State Dept. of Agriculture, Sacramento. Pesticide Advisory Committee.
For primary bibliographic entry see Field 07B.
W72-14043

INDIANA WATER QUALITY, 1969, MONITOR STATION RECORDS--RIVERS AND STREAMS.
Indiana State Board of Health, Indianapolis; and Indiana Stream Pollution Control Board, Indianapolis.
For primary bibliographic entry see Field 07B.
W72-14045

WEST VIRGINIA WATER QUALITY NETWORK.
West Virginia Dept. of Natural Resources, Charleston. Div. of Water Resources.
For primary bibliographic entry see Field 07B.
W72-14048

REPORT FOR THE 12 MONTH PERIOD JULY 1, 1970-JUNE 30, 1971,
Rhode Island Dept. of Health, Providence. Div. of Water Supply and Pollution Control.
J. E. Cannon, W. J. Shea, and C. A. Maine.
1971. 92 P, 17 TAB.

Descriptors: *Water supply, *Water pollution control, *Rhode Island, *Sewage treatment, *Water quality, Water sampling, Surface waters, On-site data collections, State governments, Municipal water, Municipal wastes, Industrial wastes, Reviews, Coliforms, Pesticides, Radioactivity, Chemical analysis.

Rhode Island, in its program of water quality surveillance, has sampled all surface water supplies in the state, plus many semi-public supplies, swimming pools used by the public, industrial water supplies, private wells when pollution is suspected, and tap-water supplies. Tests include sampling for pesticides, radioactivity, bacteria, and chemical analyses. For pesticides, 42 out of 43 samples showed less than 2 ppb, and a recheck of the one water supply over this limit did not confirm the test results of the first sample. Coliform have not proved to be a major problem, although instances of contamination have occurred. Descriptions of the water supply activities of various cities are given. The report also describes water pollution control activities in Rhode Island during the period July 1, 1969 to June 30, 1970. Descriptions of over 20 municipalities' efforts are given, along with associated activities of land developers, industries and individual sewage disposal systems, in conjunction with municipal systems. Two important projects of the Blackstone Valley Sewer District Commission are described. These are the extension of the system of interceptor sewers and construction of secondary treatment facilities at the Bucklin Point Sewage Treatment Plant. (Poertner)
W72-14051

COMPARATIVE EFFECTS OF AQUATIC BIOTOXINS ON CARDIAC SYSTEMS,
New Hampshire Univ., Durham. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W72-14056

THE ANALYSIS OF TRACE ORGANICS IN FRESH WATER BY GAS CHROMATOGRAPHY -- MASS SPECTROSCOPY,
New Hampshire Univ., Durham. Dept. of Chemistry.
J. D. Anemaet.
PhD Thesis, February 1972. 104 p, 53 fig, 14 tab, 120 ref, append. OWRR A-009-NH (3).

Descriptors: *Chemical analysis, *Extraction, *Organic compounds, *Organic acids, *Gas chromatography, *Mass spectrometry, Spectroscopy, Chromatography, Organic matter, Separation techniques, Analytical techniques.

A method for the qualitative analysis of organic substances in fresh water is presented. Four liters of water are continuously extracted with pentane. The pentane is concentrated and washed with 72% sulfuric acid to remove carbasoles and similar type compounds. The components of the pentane extract are separated by gas chromatography, using a capillary column. The separated components are directly fed to a mass spectrometer and their spectra recorded. A second four liters of water are extracted using an ion exchange column. The column is washed with sodium hydroxide and the effluent, after acidification, is extracted with chloroform followed by n-butanol. Each fraction is evaporated to dryness and the residues are methylated. The methylated residue is examined by gas chromatography, using a capillary column, and mass spectroscopy. From the pentane extract, twenty-three compounds were identified from three different classes; n-alkanes, acid esters and polynuclear aromatic hydrocarbons. From the ion exchange extract, fifteen different acids were identified and ten additional compounds remain unidentified.
W72-14057

OPTIMIZATION OF DISSOLVED OXYGEN MEASUREMENTS,
Envirogenics Co., El Monte, Calif.
H. C. Edgington.
Report available for sale by Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $1.25. Office of Saline Water Research and Development Progress Report No. 713, August 1971. 139 p, 19 fig, 44 tab, 16 ref. OSW Contract 14-30-2586.

Descriptors: *Desalination, *Distillation, *Dissolved oxygen, *Volumetric analysis, Analytical techniques, Pollutant identification, Measurement.
Identifiers: *Winkler method, End-point detection, Back titration.

The purpose was to evaluate the effect of the various parameters affecting the precision and accuracy of the Winkler method for measuring dissolved oxygen (D.O.), and to develop an optimized procedure of high accuracy and precision. Laboratory research was conducted to evaluate (1) methods for end-point detection, (2) handling parameters, (3) interferences, (4) reagent characteristics, and (5) interfering ions. Based on the results of these tests, an optimized Winkler method was developed which is capable of a precision of at least 0.75 microgram O2/l and an accuracy of 1% or 0.5 microgram O2/l (whichever is greater) in the range from 0 to saturation. The essential features of the optimized procedure are: The true D. O. Content of a sample is determined through the analysis of samples and deoxygenated samples in the NR mode. Samples are collected and fixed under N2. Excess standard thiosulfate solution is added to the fixed sample and then an aliquot is back titrated voltametrically with standard iodate solution. By this method errors due to I2 loss, interfering ions, and end-point detection are largely avoided as are corrections for iodide oxidation and D. O. blanks of the reagents. (OSW abstract)
W72-14066

CO-PRECIPITATION APPLIED IN THE DETERMINATION OF LEAD IN DRINKING WATER, (IN SERBO-CROATIAN),
Vojnomedicinska Akademija, Belgrade (Yugoslavia). Higijenskohem. Inst.
B. D. Spasojevic, and D. A. Jovanovic.
Acta Pharm Jugosl. 21 (3): 103-107. Illus. 1971. English summary.
Identifiers: Pollutant determination, *Lead, Polarography, *Chemical precipitation, *Potable water.

Co-precipitation by zinc phosphate was used in the determination of Pb in drinking water. The precipitate was separated through a sintered glass filter and after its dissolution in diluted HNO3, Pb was determinated by polarography. In the range from 0 to 25 microgram (0.125 mg/l) the recovery amounts to 96-98% of the Pb present in the sample. As the maximum permissible level of Pb in drinking water is limited to 0.050 mg/l, the procedure described can be successfully used in the Pb intake control.--Copyright 1972, Biological Abstracts, Inc.
W72-14179

ARAZATE METHOD FOR ESTIMATING COPPER IN WATER,
Connecticut Univ., Storrs. Dept. of Animal Industries.
A. C. Smith.
J Dairy Sci. 55 (1): 39-41. 1972.
Identifiers: *Arazate, Contamination, *Copper, *Milk, Analytical techniques, Pollutant identification.

(A determination of Cu in water is needed to minimize Cu contamination during handling, cooling and processing of milk.) A method using zinc dibenzyldithiocarbamate (Arazate) for estimating Cu in water was not significantly different from the Bathocuproine procedure. Repeatability trials at 2 levels of Cu gave standard deviations of 0.001 and 0.002 ppm. Twelve samples with 0.1 and 0.2 ppm of added Cu had recoveries of 93 to 104% and 93 to 103% with means of 100 and 99%. The presence of >10 ppm of chlorine, however, interfered with the recovery of Cu.--Copyright 1972, Biological Abstracts, Inc.
W72-14191

5B. Sources of Pollution

SAMPLING AND SPATIAL DISTRIBUTION OF BENTHONIC FORAMINIFERA,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.

For primary bibliographic entry see Field 05A.
W72-13674

EFFECT OF PH ON THE FILTRATION OF AQUATIC HUMUS USING GELS AND MEMBRANES,
Norsk Institutt for Vannforskning, Oslo.
For primary bibliographic entry see Field 05A.
W72-13681

SEASONAL VARIATION OF THE SUSPENDED SOLID MATTER, OFF THE COAST OF NORTH YORKSHIRE,
Leeds Univ. (England). Wellcome Marine Lab.
A. J. Newton, and J. S. Gray.
Journal of the Marine Biological Association of the United Kingdom, Vol. 52, No. 1, p 33-47, February 1972. 4 fig, 5 tab, 17 ref.

Descriptors: *Suspended solids, *Organic matter, Sea water, Coasts, Statistical methods, Water temperature, Tidal effects, Waves, River flow, Flow rates, Mathematical models, Regression analysis, Salinity, Wind, Rainfall, Filtration, Suspended load, Water analysis, Tides, Statistical models, Currents (Water), Sampling.
Identifiers: *Seasonal variation, *North Sea, Sea state, Tidal range, River Esk.

Water samples were taken weekly over a 2-year period from three sampling sites on the North Sea to determine seasonal variation in suspended solids. Samples were collected in a 2-liter automatic sampler and taken to the laboratory in polypropylene bottles. They were vigorously agitated to resuspend any settled solid material and analyzed by a filtration process. A number of parameters were measured at the sampling sites for possible correlation with distribution of suspended solids: temperature, salinity, tidal range, wind, rainfall, flow rate of the River Esk, and sea state. Sea state, sea temperature, tidal range, and river flow correlated significantly with suspended solid values. It was suggested that most of the variation in the load of suspended matter in this area is controlled by wave action, tidal currents, and river flow. The correlation with temperature was not felt to be a causal relationship. Using multiple regression equations as mathematical models, it was possible to derive accurate predictions of the natural suspended solid load. These models could then be used to detect changes in suspended load under discharge conditions. (Mortland-Battelle)
W72-13682

OZONATION REACTIONS OF SELECTED PESTICIDES FOR WATER POLLUTION ABATEMENT,
Washington State Univ., Pullman.
For primary bibliographic entry see Field 05G.
W72-13685

CELLULOLYTIC ACTIVITY IN MUNICIPAL SOLID WASTE COMPOSTING,
Bureau of Solid Waste Management, Cincinnati, Ohio.
F. J. Stutzenberge, A. J. Kaufman, and R. D. Lossin.
Canadian Journal of Microbiology, Vol 16, 1970, p 553-560, 10 fig, 26 ref.

Descriptors: *Municipal wastes, *Cellulose, *Microorganisms, Temperature, Hydrogen ion concentration, *Degradation (Decomposition).
Identifiers: *Composting, Open windrow method, Aspergillus fumigatus, Bacillus, Thermoactinomyces, *Cellulose activity.

Those factors that might influence cellulose decomposition during the open windrow method of municipal solid waste composting were investigated. Composting temperatures reached a maximum of 55-65 degree C at 3 weeks and then gradually decreased during the rest of the 79 day process. The pH values of compost samples homogenized in distilled water decreased slightly during the initial stages of the process and then increased gradually to final values of 7.0-8.5. Clarified compost extracts were assayed for cellulose activity by measuring the hydrolysis rate of carboxymethylcellulose (CMC). Maximal cellulose activity of compost increased 10-fold at a logarithmic rate while the cellulose content decreased 50%. In a preliminary search for microorganisms active in cellulose degradation during the composting process, three cellulolytic species were isolated; these were identified as Aspergillus fumigatus, a Bacillus species and a Thermoactinomyces species of the Actinobifida group. (Galwardi-Texas)
W72-13686

A PROBABILISTIC ANALYSIS OF DISSOLVED OXYGEN-BIOCHEMICAL OXYGEN DEMAND RELATIONSHIP IN STREAMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
V. Kothandaraman.
Available from University Microfilms, Ann Arbor, Michigan. Order No. 69-1374, Microfilm $3.00, Xerox $7.80. Ph. D. Dissertation, June 1968, 168 p.

Descriptors: *Dissolved oxygen, *Stream stabilization, *Statistical models, Simulation analysis, Monte Carlo Method, Ohio River, *Biochemical oxygen demand.
Identifiers: *Dissolved oxygen deficit, Deoxygenation coefficient, Reaeration coefficient.

A method for the prediction of dissolved oxygen deficits in a stream with known initial conditions was developed by taking into account the variations in deoxygenation and reaeration coefficients. A hypothetical stream situation was used to establish the significance in predicting dissolved oxygen deficit. Statistical models were formulated and tested for the variations in these coefficients using published data. Simulation techniques using the Monte Carlo method were employed in predicting the probabilistic variation in dissolved oxygen deficits for known initial conditions and the results were verified with survey data observed for the Ohio River-Cincinnati Pool reach. The predicted results using probabilistic models were found to agree with the observed values within practical limits and gave more consistent results than conventional methods. (Galwardi-Texas)
W72-13688

OBSERVATIONS ON THE MERCURY CONTENT OF MYOXOCEPHALUS QUADRICORNIS (L.) (TELEOSTEI, COTTIDAE) IN FINLAND,
Helsinki Univ. (Finland). Zoological Museum.

Ann Zool Fenn. Vol 8, No. 3, p 331-335, 1971. Illus.

Descriptors:
Identifiers: Path of pollutants, cottidae, Finland, *Mercury, Myoxocephalus quadricornis, Teleostei, Fish physiology, Oxygen.

The Hg content was determined in the fourhorn sculpin, a glacial relict occurring in the Baltic and in some lakes. In an unpolluted area of the Baltic the Hg content varied between 0.06-0.36 ppm, being positively correlated with size. In the stunted specimens of Lake Ladoga the content was the same as in the largest specimens in the Baltic. In the Hg-polluted lake Paijanne the Hg content of M. quadricornis was elevated with values up to 1.9 ppm. In another lake, Nasijavi, with the same degree of Hg pollution, however, the Hg contamination of M. quadricornis was very low (0.02-0.28ppm), possibly because the O sub 2 content of its waters is so low.--Copyright 1972, Biological Abstracts, Inc.
W72-13695

GEOLOGICAL CONSIDERATIONS OF SANITARY LANDFILL SITE EVALUATIONS,
Geological Survey, Morgantown, W. Va.
P. Lessing, and R. S. Reppert.
West Virginia Geological and Economic Survey Environmental Geology Bulletin No 1, 1971. 33 p, 4 fig, 1 tab, 16 ref, 4 append.

Descriptors: *Sanitary engineering, *Landfills, *Waste disposal, *Water pollution control, *Geological surveys, Topography, Geology, Bedrock, Soils, Hydrology, Planning, Solid wastes, West Virginia.

The geologic aspects of a landfill, both advantageous and detrimental, are discussed. Topics include topography, bedrock, geology, soil, and hydrology. Geologic guidelines are suggested that will lead to proper site location and minimum pollution. Landfills, by their nature, produce and contribute various gases, leachate, organic and inorganic solids and liquids, and noxious odors to out environment. Proper evaluation and management of landfills will minimize the affect of these elements upon the environment. Thus landfills should not be in contact with surface water. Surface drainage should be diverted around landfills to prevent flow through, over, or near the landfill. This is particularly important at sites near rivers and creeks that may flood. Included are a list of pertinent references and four appendixes. (Woodard-USGS)
W72-13719

WATER-QUALITY RECONNAISANCE OF THE LOWER SANTA ANA RIVER CANYON, SOUTHERN CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02K.
W72-13720

FRESH WATER WINNING AND SALT WATER ENCROACHMENT IN THE AMSTERDAM DUNE WATER CATCHMENT AREA,
Amsterdam Water Works (Netherlands).
For primary bibliographic entry see Field 04B.
W72-13724

APPLICATION OF NATURAL ISOTOPES IN GROUND WATER HYDROLOGY,
Groningen Rijksuniversiteit (Netherlands). Physics Lab.
For primary bibliographic entry see Field 02F.
W72-13728

WATER QUALITY OF STREAMS IN THE NESHAMINY CREEK BASIN, PENNSYLVANIA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02K.
W72-13737

THERMAL AQUACULTURE: ENGINEERING AND ECONOMICS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 06B.
W72-13743

EFFECTS OF LAND USE ON MUNICIPAL WATERSHEDS,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 04C.
W72-13759

THE QUANTIMET 720P FOR ROUTINE BIOLOGICAL ASSAY AND POTENCY CALCULATION FROM COLONY COUNT, INHIBITION AND EXHIBITION ZONE MEASUREMENTS,
Imanco Ltd., Royston (England).
C. P. Bond, D. J. Berry, and J. A. Crawley.

The Microscope, Vol 20, No 1, p 165-174, April 1972. 8 fig, 2 ref.

Descriptors: *Bioassay, Assay, *Bacteria, Viability, Pollutant identification, Inhibition, Laboratory equipment, Automation, Computers, Nutrients, Antibiotics (Pesticides), Microorganisms, Microscopy, Quality control.
Identifiers: *Quantimet 720P Petriscope, *Counting, Dark field illumination, Accuracy, Reproducibility, Detection.

The Quantimet 720 Petriscope is designed to automate microbiological examination for routine biological assay and potency calculation from colony count and for inhibition and exhibition zone measurements for research and quality control applications. Problems arise in such examinations due to the subjective assessments which have to be applied to malformed inhibition zones which often have diffuse edges and also due to errors arising from the tedium of colony counting. The Quantimet 720P accurately counts and sizes bacterial colonies using dark field illumination without any errors due to repetition. On inhibition zone measurements, the Quantimet 720P is able to utilize different forms of illumination to overcome errors due to insufficient contrast. Dark field illumination can be used in many cases but others require a unique 'diffusion detecting' graticule between the bright field illumination source and the petri dish. The image of the graticule is then detected through areas of inhibition but not through areas of microbiological growth. These alternative forms of illumination allow completely reproducible, objective measurements to be made on zone areas of diameters with on-line automatic calculation and print-out of potency in real time. (Byrd-Battelle)
W72-13762

A REVIEW OF THE METHODS FOR THE IDENTIFICATION OF PERSISTENT HYDROCARBON POLLUTANTS ON SEAS AND BEACHES,
Shell Research Ltd., Chester (England). Thornton Research Center.
For primary bibliographic entry see Field 05A.
W72-13766

THE PRESENT STATUS AND FUTURE PROSPECT OF THE TURBIDOSTAT,
National Chemical Research Lab., Pretoria (South Africa).
For primary bibliographic entry see Field 05A.
W72-13772

THE ANNUAL CYCLE IN QUANTITY AND COMPOSITION OF THE ZOOPLANKTON OF THE SARGASSO SEA OFF BERMUDA. II. THE SURFACE TO 2,000 M,
Dalhousie Univ., Halifax (Nova Scotia). Inst. of Oceanography.
G. B. Deevey, and A. L. Brooks.
Limnology and Oceanography, Vol 16, No 6, p 927-943, November 1971. 17 fig, 3 tab, 23 ref.

Descriptors: *Zooplankton, *Seasonal, *Distribution patterns, Crustaceans, Systematics, Sampling, Gastropods, Mollusks, Protozoa, Worms, Larvae, Plankton nets, Copepods, Sea water, Nets, Equipment, Marine animals, Amphipods.
Identifiers: *Sargasso Sea, Tunicates, Coelenterates, Chaetognaths, Macroinvertebrates, Bermuda, Ostracods, Euphausiids, Foraminifera, Pteropods, Spinocalanus, Mecynocera, Pleuromamma, Calocalanus, Heterorhabdus, Lucicutia, Haloptilus, Clausocalanus, Phyllopus, Eucalanus, Metridia, Calanus, Rhincalanus, Oithona, Oncaea, Mormonilla, Conaea, Farranula, Calanus tenuicornis, Calanus finmarchicus, Nannocalanus minor, Macrocypridina, Halocypris, Halocypria, Archiconchoecia, Conchoecia, Euconchoecia, Evadne spinifera, Lucifer typus, Fritilliaria, Oikopleura, Sagitta minima, Sagitta lyra, Sagitta macrocephala, Eukrohnia, Krohnitta subtilis, Spiratella (Limacina), inflata, Desmopterus papilio.

A qualitative and quantitative year-round study has been made of the microzooplankton of the 2000-m water column in the Sargasso Sea. Monthly hauls were made over four depth ranges. For hauls of the upper 500 m, an open meter net of No. 2 and No. 8 nylon equipped with a flowmeter was used. The other three depth ranges were sampled with a 0.75 square meter Be plankton sampler with the individually metered nets of No. 8 mesh. Each net was towed for 10-20 min at 1-2 knots when it reached the approximate center of its depth range. In the upper 500 m highest numbers were found in October and April; between 500 and 1,000 m the highest numbers were present in July, March, and May; from 1,000 to 5,000 m the numbers were highest in August, January, and March. In the deepest waters sampled numbers were highest in July, October, March, and May. Crustacea increased in importance and in diversity below 500 m. Copepods comprised 70 percent of the plankton of the upper 500 m and 85.2 percent in the deepest waters sampled. Pelagic ostracods were next in importance, but were relatively less numerous below 1,500 m. Highest numbers of calanoid genera and ostracod species were noted between 500 and 1,500 m. Euphausiids were most numerous between 1,500 and 2,000 m with a November maximum. Tunicates, coelenterates, chaetognaths, Foraminifera, pteropods, and various larval forms were most abundant in numbers and species in the upper waters, but occurred in small numbers below 500 m. (Mortland-Battelle)
W72-13775

NICKEL POLLUTION,
University Coll. of Wales, Aberystwyth. Dept. of Agricultural Biochemistry; and University Coll. of Wales, Aberystwyth. Dept. of Biochemistry.
For primary bibliographic entry see Field 05A.
W72-13778

METABOLISM OF POLYCHLORINATED NORBORNENES BY CLOSTRIDIUM BUTYRICUM,
Mainz Univ. (West Germany). Institut fuer Anorganische Chemie und Kernchemie.
I. Schuphan, and K. Ballschmiter.
Nature, Vol 237, No 5350, p 100-101, May 12, 1972. 2 fig, 1 tab, 12 ref.

Descriptors: *Metabolism, *Chlorinated hydrocarbon pesticides, Clostridium, Yeasts, Halogenated pesticides, Separation techniques, Anaerobic bacteria, Cultures, Soil microorganisms, Soil bacteria, Organic pesticides, Soil contamination, Chemical reactions.
Identifiers: *Clostridium butyricum, *Polychlorinated norbornenes, Saccharomyces, Fate of pollutants, Substrate utilization, Electron capture gas chromatography, Dechlorination.

In order to determine the ability of Clostridium butyricum to metabolize polychlorinated norbornenes, cells were grown anaerobically on water-covered potatoes and subjected to various concentrations (0.1-1,000 ppm) of norbornenes. At the end of an experiment the whole culture medium was homogenized and extracted with toluene. The resulting solution was used for electron capture gas chromatography. Culture and potatoes gave no interfering peaks in the chromatogram. The results obtained show that C. butyricum metabolizes hexa, penta, and tetrachloro-norbornenes. No dechlorinated products of the hexachloro-norbornene could be found using well-aerated yeast (Saccharomyces) cultures or soil microorganisms, mostly actinomycetes, on agar plates. To what extent the dechlorination reactions described can be found with other microorganisms is under investigation. (Long-Battelle)
W72-13779

SALMONELLA.
Defense Documentation Center, Alexandria, Va.
For primary bibliographic entry see Field 05C.
W72-13800

REGULARITIES OF SR90 AND CS137 CIRCULATION IN DIFFERENT LINKS OF FOOD CHAIN IN ZOOCOENOSIS,
Akademiya Nauk SSSR, Moscow. Inst. of Animal Morphology.
A. I. Il'Enko.
Zh Obshch Biol. Vol 31, No 6, p 698-709, 1970. (English summary).
Identifiers: *Path of pollutants, *Food chains, Birds, Cesium-137, Circulation, Fish, Food, Links, Mammals, Reptiles, Strontium-90, Zoocoenosis.

Sr90 and Cs137 circulation was studied in different links of food chains. Their distribution from prey to predators (predatory fishes, reptiles and mammals), the content of Sr90 increases and that of Cs137 decreases in some tissues of mammals, phytophagous and insectivorous birds were compared. Transfer of these tracers from prey body to predators (predatory fishes, reptiles and mammals) show the content of Sr90 and Cs137 in the skeleton and muscles of the predator increases. The amount of Cs137 in muscles of predatory birds is lower than in the body of rodents on which they feed and that of Sr90 in the bone tissue of predators is lower than in prey skeleton. Differences in the content of tracers in various links of food chains in the biocoenosis are due to ecological and morphological differences between the organisms. The amount of tracers varies in animals which differ in feeding habits.--Copyright 1971, Biological Abstracts, Inc.
W72-13801

OIL POLLUTION: PERSISTENCE AND DEGRADATION OF SPILLED FUEL OIL,
Woods Hole Oceanographic Institution, Mass.
M. Blumer, and J. Sass.
Science, Vol 176, No 4039, p 1120-1122, June 9, 1972. 3 fig, 8 ref.

Descriptors: *Oil spills, *Environmental effects, *Sediments, *Persistence, *Degradation (Decomposition), Water pollution sources, Oil pollution, On-site investigations, Sampling, Gas chromatography, Organic compounds, Mass spectrometry, Aromatic compounds, Biodegradation, Physical properties, Coasts, Massachusetts, Pollutant identification, Microbial degradation.
Identifiers: *Fuel oil, Heptadecane, Alkanes, Isoprenoids, Phytane, Benzene, Naphthalane, Crude oil, Buzzards Bay, Pristane, Substrate utilization.

A 2-year old oil spill site in Buzzards Bay, Massachusetts, where 600 metric tons of oil had been spilled, was studied in order to gain information on the persistence and degradation of spilled oil in a coastal environment. Measurements of oil degradation in this area involved determining the n-Csub17/pristane ratio in sediments. Hydrocarbons were identified by chromatographic and mass spectrometric analyses. The results indicated that fluctuations in hydrocarbon degradation products found in sediments were due to weathering, oxygen availability, and location. The slow hydrocarbon degradation, as evidenced by their persistence over a two-year period, was principally carried out by microbial utilization of alkanes and the partial dissolution of lower-boiling aromatic hydrocarbons. Field and laboratory observations confirm that there is a decrease in the degradation rate from normal alkanes to iso- and cycloalkanes and to aromatic hydrocarbons. Branched and cyclic hydrocarbons are attacked even more slowly than the n-alkanes; after 2 years, isoprenoids (phytane, pristane, and the C sub 18 homolog) were evident and alicyclic and aromatic hydrocarbons remained prominent in the polluted sediments. The boiling range of the spilled oil and the relative abundances

of homologous hydrocarbons (e.g., phytane and pristane) have been well preserved. The above findings are in agreement with the known geochemical stability of hydrocarbons. (Long-Battelle)
W72-13810

GENERAL GROUND-WATER QUALITY IN FRESH-WATER AQUIFERS OF DELAWARE,
Delaware Geological Survey, Newark.
K. D. Woodruff.
Report of Investigations No 15, July 1970. 22 p, 5 fig, 5 tab, 8 ref.

Descriptors: *Groundwater resources, *Water quality, *Chemical analysis, *Aquifers, *Delaware, Sampling, Water wells, Water demand, Freshwater, Dissolved solids, Specific conductivity, Iron, Nitrates, Water utilization, Water supply.
Identifiers: *Groundwater quality, *Freshwater aquifers.

Information on groundwater quality in Delaware has become critical for three reasons: (1) increased water demand, (2) need for a better understanding of groundwater flow patterns, (3) need for a 'base' against which future quality changes can be measured. Analyses of about 150 water quality samples from wells show that Delaware's fresh groundwaters are suitable for most purposes. High iron content may occur, however, in wells tapping the Columbia and the Potomac Formations. Overall, total dissolved solids in Delaware aquifers are relatively low except in the Cheswold and Frederica aquifers Miocene), and parts of the Piney Point Formation (Eocene). High nitrates were found in a few wells tapping the Columbia formation and may be due to the use of agricultural fertilizers. The average ratio of total dissolved solids to specific conductivity computed from samples was 0.70. Except for the Magothy Gormation, no simple relationship was observed between groundwater quality and depth in fresh water-bearing portions of the aquifers. (See also W72-13833 and W72-13834) (Woodard-USGS)
W72-13832

NITRATE CONTAMINATION OF THE WATER--TABLE AQUIFER IN DELAWARE,
Delaware Geological Survey, Newark.
J. C. Miller.
Report of Investigations No 20, May 1972. 36 p, 10 fig, 2 tab, 46 ref.

Descriptors: *Water pollution sources, *Groundwater, *Nitrates, *Delaware, *Chemical analysis, Water supply, Septic tanks, Sampling, Water analysis, Water wells, Data collections, Soil properties, Aquifer characteristics, Water pollution control.
Identifiers: *New Castle County (Del), *Kent County (Del).

The increasing population of the State of Delaware is placing severe strains on the quality of groundwater in the water-table aquifer by disposing of septic-tank effluent in the soil. The permeable water-table aquifer, containing reserves of 331 million gallons per day, is very vulnerable to contamination by objectionable or toxic fluids and dissolved substances placed on or in the soil. Two areas were studied in order to evaluate the problem. A nitrate specific-ion electrode was used for the analyses. The first area, in the vicinity of Porter-Woods roads in New Castel County, has soils of very low permeability, is generally water logged during the rainy seasons, and has a very high water table. Groundwaters in this area had very low nitrate contents due to a lack of oxidizing conditions in the soils, but overflowing septic-tank systems cause overland movement of bacteria into shallow wells. The second area, south of Moores Lake in Kent County, has very permeable soils and underlying sands with a low water table. Nitrate levels from one to three times the health limit for drinking water were in the area. Deep wells into artesian aquifers are the immediate remedial measure for the Moores Lake area until the community is served by public sewers. (See also W72-13832 and W72-13833) (Woodard-USGS)
W72-13834

EXPERIMENTAL INJECTION OF TERTIARY--TREATED SEWAGE IN A DEEP WELL AT BAY PARK, LONG ISLAND, N. Y.--A SUMMARY OF EARLY RESULTS,
Geological Survey, Mineola, N.Y.
J. Vecchioli.
New England Water Works Association, Vol 86, No 2, p 87-103, June 1972. 4 fig, 5 tab, 12 ref.

Descriptors: *Injection wells, *Artificial recharge, *Reclaimed water, *New York, Sewage, Aquifer characteristics, Water quality, Methodology, Groundwater movement, Saline water intrusion, Salinity, Well filters, Well screens, Clogging, Deep wells.
Identifiers: *Long Island (NY).

As of May 1971, nine groundwater recharge tests ranging in duration from 2 to 33 days had been made at Bay Park, Long Island, New York. Injection rate was generally 350 gpm. The maximum volume injected in any one test was 14 million gallons. After each test, the injection well was pumped to waste, partly to restore lost capacity and partly to extract water previously recharged and, thus, to restore the quality of the water in the Magothy aquifer to near-native condition. Reclaimed water was injected through a gravel-packed well constructed with an 18-inch diameter fiberglass casing above a 16-inch diameter stainless-steel screen. The experiments have shown that the Magothy aquifer can be recharged with reclaimed water through the use of injection wells. Stringent quality requirements would have to be maintained on the injected water to minimize well clogging. For example, turbidity, iron, aluminum, and phosphate contents of the injection water would have to be kept at near-zero levels, and the water would have to be chlorinated; otherwise, the rate of clogging would require frequent redevelopment of the well. (Woodard-USGS)
W72-13839

HYDROLOGY OF ALABAMA AREAS--COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY,
Alabama Marine Resources Lab., Dauphin Island.
E. I. Bault.
Available from the National Technical Information Service as COM-72-104687, $3.00 in paper copy, $0.95 in microfiche. Alabama Marine Resources Bulletin, No 7, February 1972. 36 p, 18 fig, 2 tab, 22 ref.

Descriptors: *Estuaries, *Water pollution sources, *Path of pollutants, *Chemical analysis, *Alabama, Gulf of Mexico, Deltas, Industrial wastes, Sewage, Nitrates, Phosphates, Dissolved oxygen, Water temperature, Turbidity, Salinity, Data collections, Sampling, Tidal effects, Winds.

Twenty-one hydrological stations in five Alabama estuarine areas were sampled monthly from January, 1968 through March 1969. Nitrite-nitrogen, nitrate-nitrogen, orthophosphate-phosphorus, total phosphorus, pH, dissolved oxygen, temperature, turbidity and salinity were determined at each station. Bimonthly isohalines and isotherms and graphical representations of micronutrients and chemophysical parameters are presented. All data are presented in tables or graphs, and comparisons are made among the estuarine areas. The Mobile Delta had the highest nitrate, nitrite, and total phosphorus values of any Alabama estuarine study area. The Mobile River is the principal pollution source in this area with an excess of 90% of the pollution of the Mobile Delta in its waters. The high nitrite values are principally caused by domestic sewage from Mobile and paper mill effluents. (Woodard-USGS)
W72-13840

ENDOSULFAN IN THE RHINE RIVER,
Rijksinstituut voor de Volksgezondheid, Utrecht (Netherlands).
For primary bibliographic entry see Field 05C.
W72-13847

SUSPENDED SEDIMENT DATA SUMMARY MARCH 1966-MAY 1967, UPPER CHESAPEAKE BAY (TOLCHESTER TO HAVRE DE GRACE),
Maryland Fish and Wildlife Administration, Annapolis.
For primary bibliographic entry see Field 02L.
W72-13849

PRELIMINARY REPORT ON TECHNIQUES FOR MARINE MONITORING SYSTEMS,
University of Southern California, Los Angeles. Dept. of Biological Sciences.
D. F. Soule, and J. D. Soule.
Available from the National Technical Information Service as COM-72-10452, $3.00 in paper copy, $0.95 in microfiche. Sea Grant Program Technical Note USC-SG-IT-71, August 1971. 5 p, 6 fig.

Descriptors: *Monitoring, *Water pollution sources, *Marine biology, *Harbors, *California, Analytical techniques, Methodology, Pacific coast region, Marine animals, Marine plants, Ecology, Environmental effects.
Identifiers: *Monitoring techniques, Settling racks.

Techniques for monitoring systems to assist in assessing the impact of pollution on marine biotic communities are presented. Described is a system consisting of attaching small settling racks to docks, floats and buoys, which is effective in evaluating the biotic content of the water column. Racks were installed at 8 locations in the Los Angeles Harbor and adjacent coastal waters and changed monthly. At the same time racks were changed, plankton tows were made and productivity measurements were conducted. Benthic samples were taken with either an orange peel or small Campbell grab. Sediment samples were collected. Temperature and oxygen readings were made at each station. Settling racks have acted as effective substrates for good growth of several species of hydroids, tunicates, polychaete worms, caprellids, amphipods and other crustaceans, bryozoans, mollusks, and echinderms, as well as the algae Ulva and Enteromorpha. The racks have provided a more diverse assemblage of organisms in every instance than the benthic samples taken at the same time. (Woodard-USGS)
W72-13850

INVESTIGATIONS OF ORGANIC MATTER IN GROUNDWATER OF OIL- AND GAS-BEARING REGIONS (METODICHESKIYE ISSLEDOVANIYA V OBLASTI IZUCHENIYA ORGANICHESKOGO VESHCHESTVA PODZEMNYKH VOD NEFTEGAZONOSNYKH OBLASTEY),

Descriptors: *Groundwater, *Organic matter, *Natural gas, *Oil, *Water chemistry, Geochemistry, Chemical reactions, Physicochemical properties, Aqueous solutions, Solutes, Organic compounds, Carbon, Inorganic compounds, Rocks, Hydrogeology, Exploration, Water sampling, Analytical techniques, Investigations, Instrumentation.
Identifiers: *USSR, Reagents, Humic acids, Pyridine, Iodation, Bitumen, Dispersion halos, Skewness.

This collection of 11 papers presents the results of investigations conducted in 1967-68 by the Laboratory of Hydrochemistry and Hydrogeology of the Moscow Institute of Geology and processing of Mineral Fuels. Topics discussed include: (1) organic-matter components in groundwater as possible indicators of oil and gas deposits; (2) composition of chloroform extracts and carbon eluates from groundwater; pyridine as a direct indicator of productivity in oil and gas prospecting; (5) determination of total organic carbon in natural waters containing large amounts of chlorides and carbonates; (6) determination of humic acids in groundwater; and (7) refined procedures for determining iodate oxidation. (Josefson-USGS)
W72-13856

MARIN ENVIRONMENTAL QUALITY, SUGGESTED RESEARCH PROGRAMS FOR UNDERSTANDING MAN'S EFFECT ON THE OCEANS.
National Academy of Sciences-National Research Council, Washington, D.C. Committee on Ocean Sciences.
For primary bibliographic entry see Field 05A.
W72-13903

A FRAMEWORK FOR IDENTIFICATION AND CONTROL OF RESOURCE DEGRADATION AND CONFLICT IN THE MULTIPLE USE OF THE COASTAL ZONE,
California Univ., Berkeley. Dept. of Landscape Architecture.
For primary bibliographic entry see Field 05G.
W72-13906

DDT RESIDUES IN EIGHT CALIFORNIA MARINE FISHES,
Philadelphia Community Coll., Pa.
S. B. Shaw.
Calif Fish Game. 58 (1): 22-26. 1972.
Identifiers: *California, Chromatography, *DDT, English, Fish, Lingcod, Marine fish, Petrale, Rattail, Sablefish, Sole, *Monterey Bay, *Pesticide residues.

Levels of DDT, DDD, DDE, and total DDT residues in the livers and flesh of marine fishes, mainly from Monterey Bay, were determined using gas-liquid chromatography. Mean values for total DDT residues for liver ranged from 4.7 ppm wet weight (rough scale rattail) to 0.22 ppm (lingcod), and for flesh ranged from 2.0 ppm (sablefish) to 0.035 ppm (lingcod). Maximum values for total DDT residues in some individual fishes approached or exceeded FDA limits of 5.0 ppm wet weight, e.g., for livers: sanddab 13 ppm, rough-scale rattail 7.9 ppm, sablefish 6.9 ppm, English sole 6.1 ppm, and petrale sole 4.8 ppm; for flesh: sablefish 6.3 ppm and rough-scale rattail 4.7 ppm.--Copyright 1972, Biological Abstracts, Inc.
W72-13946

FAIRPORT HARBOR, LAKE COUNTY, OHIO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 04A.
W72-13961

LORAIN HARBOR, OHIO (MAINTENANCE) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 04A.
W72-13962

ON THE PHYSICO-CHEMICAL BEHAVIOR OF RADIOACTIVE CERIUM IN SEA WATER,
National Inst. of Radiological Sciences, Nakaminato (Japan). Marine Radio-Ecological Research Station.
S. Hirano, T. Koyanagi, and M. Saiki.
In: Symposium on the Interaction of Radioactive Contaminants with the Constituents of the Marine Environment, July 10-14, 1972, Seattle, Washington. Paper No. IAEA/SM-158/3. 13 p, 4 fig, 9 ref.

Descriptors: *Radioisotopes, *Fallout, *Nuclear explosions, *Effluents, Radioactive waste disposal, Assay, Physiochemical properties, Behavior, Oceans, Equilibrium, Hydrogen ion concentration, Chemical reactions, Path of pollutants, Water pollution sources.
Identifiers: *Radioactive cerium.

An experiment to enhance the knowledge of the physico-chemical behavior of radioactive cerium in sea water was conducted. A summarization of the results includes: Radioactive cerium in sea water exists mainly in dissolved form with about 20% to 25% forming into the particulate state of more than 1.2 microns in diameter. A considerable portion of radioactive cerium exists as ionic species in sea water. Radioactive cerium is hydrolyzed slowly at pH greater than 6. Equilibrium between natural cerium and radioactive cerium may be achieved after a fairly long time. (Houser-ORNL)
W72-13970

U234/U238 DISEQUILIBRIUM IN GROUNDWATERS OF CENTRAL TEXAS,
Rice Univ., Houston, Tex. Dept. of Geology.
Joel Kronfeld.
Publication No. GJO-935-1 (Pt. 2), p 303-310, June 1971. 11 ref.

Descriptors: *Radioactivity, *Uranium radioisotopes, *Equilibrium, *Hydrologic systems, Groundwater, Surface waters, Surface-groundwater relationships, Water pollution, Analytical techniques, Isotope fractionation, Aquifers, *Texas.
Identifiers: *Trinity aquifer, *Lake Waco (Tex).

Samples of ground and surface waters from central Texas were analyzed for U content and U234/U238 ratio. The analysis method and results are presented. Surface U concentrations and isotopic ratios contrasted markedly with subsurface values. In general, surface U concentrations were higher than subsurface and were much closer to isotopic equilibrium. Lake Waco water samples had a U234 ratio of 1.2 and a U content of 0.66 ppM while ground water from beneath the city of Waco had a ratio of 5.6 and U content of 0.07 ppM. Surface waters exhibited between 15 and 40% excess U234. The ground water samples exhibited between 250 and 1300% relative enrichment of U234. The factors governing the extreme fractionation were not established. (Houser-ORNL)
W72-13971

SORPTION-DESORPTION REACTIONS OF MERCURY WITH SUSPENDED MATTER IN THE COLUMBIA RIVER,
Washington Univ., Seattle. Dept. of Oceanography.
M. H. Bothner, and R. Carpenter.
In: Symposium on the Interaction of Radioactive Contaminants with the Constituents of the Marine Environment, July 10-14, 1972, Seattle, Washington. Paper IAEA/SM-158/5. 18 p, 9 fig, 1 tab, 16 ref.

Descriptors: *Radioisotopes, *Mercury, *Columbia River, *Pacific Ocean, *Sediment, *Suspended load, *Sorption, *Desorption, Absorption, Adsorption, Water pollution, Water pollution sources, Public health, Water types, Freshwater, Saline water, Path of pollutants.

The fluence of Columbia River suspended matter on the fate of dissolved mercury in the river and during the transition from the river to the oceanic environment has been investigated. Experimental results show that both inorganic and methyl mercury are fairly rapidly taken up by the natural assemblage of Columbia River particulates. The desorption experiments show that at least half of each of these forms is fairly easily desorbed by filtered river water of lower total mercury content. Subsequent washes with sea water remove little additional mercury from the particulates during roughly one week of contact time. (Houser-ORNL)
W72-13972

DISTRIBUTION PATTERNS FOR SOME PARTICULATE AND DISSOLVED TRACE METALS WITHIN AN ACTIVE GLACIAL FJORD,
Alaska Univ., College. Inst. of Marine Science.
D. C. Burrell.
In: Symposium on the Interaction of Radioactive Contaminants with the Constituents of the Marine Environment, July 10-14, 1972, Seattle, Washington, Paper No. IAEA/SM-158/6. 25 p, 11 fig, 5 tab, 33 ref.

Descriptors: *Distribution patterns, *Hydrographs, *Sediment distribution, *Fjords, *Glaciers, *Alaska, Cold region, Sediment distribution, Sediment load, Suspended solids, Deposition (Sediment), Trace elements, Zinc, Copper, Lead, Nickel, *Path of pollutants, Water pollution sources.

The distribution patterns of some trace metals between water and both suspended and deposited sediment has been studied in a non-iceberg fjord-estuary in S.E. Alaska. The hydrography of this type of fjord is such that, during the summer, glacial meltwater runoff enters the marine fjord initially as a concentrated sediment-plume on the surface. This sediment subsequently flocculates and settles through the subhalocline portion of the marine column. The soluble zinc content of the glacial fresh water is slightly lower than that of the marine water, and the total fresh water particulate zinc is predominantly structural. In this environment there appears to be adsorption of zinc across the halocline; and copper, lead, and nickel are covariant with iron and the suspended sediment load. The sediment deposition rates in this fjord type are very high, and the sediment texture, composition, and chemistry is uniform through the surface meter or so. The organic carbon content is around 0.1% only. The interstitial water contents of both zinc and copper approximate those in overlying water. (Houser-ORNL)
W72-13973

ADSORPTION-DESORPTION EQUILIBRIA OF SOME RADIONUCLIDES IN SEDIMENT-FRESHWATER AND SEDIMENT-SEAWATER SYSTEMS,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco).
C. N. Murray, and L. Murray.
In: Symposium on the Interaction of Radioactive Contaminants with the Constituents of the Marine Environment, July 10-14, 1972, Seattle, Washington. Paper No. IAEA/SM-158/7. 26 p, 11 fig, 3 tab, 28 ref.

Descriptors: *Radioisotopes, *Absorption, *Adsorption, *Sorption, *Decontamination (Water), Ion exchange, *Demineralization, Water, Rivers, Oceans, Freshwater, Sea water, Marine water, Salinity, Hydrogen ion concentration, Zinc, Cobalt, Equilibrium, *Sediment-water interfaces, Path of pollutants, Water pollution sources.
Identifiers: *Desorption, *Silver.

Experiments were made to investigate the uptake of certain radionuclides on freshwater sediments in river water (adsorption) and their subsequent release from the sediments to the seawater (desorption). It was found that for the radionuclides studied, cobalt-60, zinc-65, silver-110m, their behavior was very individual. Laboratory results suggest that certain factors strongly affect the adsorption-desorption characteristics of

the sediment. The influence of important factors such as the pH of the river, estuary and seawater, the concentration of sediment and trace element in the river water, the speciation of the trace element, the mineralogy of sediment, the formation of particulate material in the river water and flocculation of this by sediment in the estuary and sea, and salinity effects on desorption are discussed. From a knowledge of these factors, it is possible to predict, as a first approximation for a given sediment, the amount of radionuclide that will be taken up by a given weight of freshwater sediment in a very simple river system under equilibrium conditions. When this sediment reaches the marine environment the amount of desorbed radionuclide can be calculated. (Houser-ORNL)
W72-13974

TRANSPORT AND DEPLETION OF RADIONUCLIDES IN THE COLUMBIA RIVER,
Battelle-Pacific Northwest Labs., Richland, Wash. Radiological Sciences Dept.
D. E. Robertson, W. B. Silker, J. C. Langford, M. R. Petersen, and R. W. Perkins.
In: Symposium on the Interaction of Radioactive Contaminants with the Constituents of the Marine Environment, July 10-14, 1972, Seattle, Washington. Paper No. IAEA/SM-158/9. 23 p, 13 fig, 1 tab, 7 ref.

Descriptors: *Nuclear powerplants, *Effluents, *Radioactive waste disposal, *Water pollution sources, *Columbia River, Sediments, Sediment transport, Deposition (Sediment), Assay measurement, Radioactivity, Seasonal, Hydrology, Distribution, Suspended solids, Biota, Plankton, *Path of pollutants.

The radionuclide transport and depletion processes in the Columbia River are being characterized following the closure of the last of the Hanford plutonium production reactors in January 1971. Radionuclide concentrations are periodically being measured in river water, sediments and biota between Hanford and Bonneville Dam to determine the rates and mechanisms of the processes which govern the distribution and behavior of the radionuclides in the Columbia River system. All of the short-lived radionuclides in the river have now decayed, but some residual long-lived radionuclides have remained in the river, being associated mainly with sedimentary deposits in the reservoir behind McNary Dam. These radionuclides are tightly bound to the sediments and enter the river mainly by resuspension, especially during the high river flow in the spring and early summer. The depth distributions of radionuclides in sediment cores collected at various locations in the reservoirs behind McNary, the Dalles, and Bonneville dams are being measured to estimate radionuclide inventories, sediment resuspension and transport, and sedimentation rates in the river system. (Houser-ORNL)
W72-13975

STUDIES ON THE BEHAVIOURS AND DISTRIBUTION OF RADIOACTIVE SUBSTANCES IN COASTAL AND ESTUARINE WATERS,
Japan Atomic Energy Research Inst., Osaka.
Y. Nishiwaki, Y. Honda, Y. Kimura, H. Morishima, and T. Koga.
In: Symposium on the Interaction of Radioactive Contaminants with the Constituents of the Marine Environment, July 10-14, 1972, Seattle, Washington. Paper No. IAEA/SM-158/11. 30 p, 15 fig, 1 tab, 9 ref.

Descriptors: *Radioisotopes, *Radioactivity effects, *Distribution, *Sediment, *Adsorption, *Hydrogen ion concentration, *Salinity, Dispersion, Tidal effects, Path of pollutants, Water pollution sources.
Identifiers: *Rare earth, *Thorium, *Osaka Bay (Japan).

Thorium and rare earth elements have continuously been discharged through a small river into the estuarine water at Osaka Bay. Studies of the variation of concentration of these elements under various natural conditions were made. Studies on adsorption of these elements on some bottom sediments were carried out in the water with different salinities and pH. One of the important factors influencing the concentration of the elements in the water is tidal oscillations. The gross beta activities in water at the same location in the estuary widely varied at each time of sampling. The dispersion of the elements in the estuarine water were not interpreted by simple dilution and diffusion of the element in water mass. The presence of the mud flats, as well as the marine meteorological conditions, seem to affect markedly the distribution of the element in the estuarine water. The adsorption of the element on the bottom sediment was influenced not only by the coarseness of the sediment but also by the salinity and pH of the water. (Houser-ORNL)
W72-13976

THE EVALUATION OF PUBLIC RADIATION EXPOSURE FROM THE CONTROLLED MARINE DISPOSAL OF RADIOACTIVE WASTE (WITH SPECIAL REFERENCE TO THE UNITED KINGDOM),
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
A. Preston, and N. T. Mitchell.
In: Symposium on the Interaction of Radioactive Contaminants with the Constituents of the Marine Environment, July 10-14, 1972, Seattle, Washington, Paper No. IAEA/SM-158/36. 20 p, 2 fig, 5 tab, 17 ref.

The application of critical path techniques is discussed in relation to the evaluation of public radiation exposure from the controlled marine disposal of radioactive waste. The discussion relates exclusively to the situation in the UK, since critical path techniques have eeen more extensively applied there and because there is a dearth of published information on which to base reliable estimates of radiation dose commitment for other situations. The principal sources of radioactive waste at this time are nuclear power programmes and especially at the stage at which fuel is reprocessed. In the UK, low level liquid radioactive wastes from these programmes are dispersed in surface waters and the inshore marine environment. The origin and nature of such of these disposals as are made to estuaries and the sea are briefly summarized and the method of control is outlined. (Houser-ORNL)
W72-13977

MUSSELS AND BARNACLES AS INDICATORS OF THE VARIATION OF MANGANESE-54, COBALT-60 AND ZINC-65 IN THE MARINE ENVIRONMENT,
Southern California Coastal Water Research Project, Los Angeles.
D. R. Young, and T. R. Folsom.
In: Symposium on the Interaction of Radioactive Contaminants with the Constituents of the Marine Environment, July 10-14, 1972, Seattle, Washington. Paper No. IAEA/SM-158/42. 18 p, 8 fig, 1 tab, 33 ref.

Descriptors: *Nuclear explosions, *Nuclear powerplants, *Fallout, *Effluents, *Water pollution sources, *Aquatic life, *Mussels, *Crustaceans, Absorption, Assay, Radio-isotopes, Zinc, Cobalt, Manganese, Radioactive tracers.
Identifiers: *Mytilus californianus.

The intertidal byssal mussel Mytilus californianus and the oceanic gooseneck barnacle Lepas anatifera are efficient indicators of spatial and temporal changes in levels of three radiometals in the marine environment. Lepas specimens collected from the northeastern Pacific during the first half of 1964 demonstrated oceanic-to-coastal ratios of manganese-54, cobalt-60, and zinc-65 fallout from the 1961-62 thermonuclear tests of approximately 3:1, 4:1, and 2:1, respectively. Cesium-137 in the surface layers of the two sectors (whose centers lie about 1,500 and 300 km west of San Diego) also showed a 3:1 oceanic-to-coastal enhancement of fallout from this source. Mytilus specimens collected during the 1963-64 along the northeastern Pacific Coast showed a fairly uniform distribution of manganese-54 and cobalt-60 between latitudes 46 and 29 degrees north, but dramatically reflected the point source of Hanford-produced zinc-65 emanating from the mouth of the Columbia River. Relatively high zinc-65 concentrations, possibly related to this source, were detected in Mytilus from northern Baja California, Mexico--1,900 km to the south. (Houser-ORNL)
W72-13978

CONCENTRATIONS OF ZINC-65 IN MARINE FOODSTUFFS AND PACIFIC COASTAL RESIDENTS,
Battelle-Pacific Northwest Labs. Richland, Wash.
T. H. Essig, G. W. R. Endres, J. K. Soldat, and J. F. Honstead.
In: Symposium on the Interaction of Radioactive Contaminants with the Constituents of the Marine Environment, July 10-14, 1972, Seattle, Washington. Paper No. IAEA/SM-158/43. 33 p, 12 fig, 5 tab, 6 ref.

Descriptors: *Nuclear powerplants, *Effluents, *Columbia River, *Pacific Ocean, *Aquatic environment, Radioisotopes, Water pollution, Water pollution sources, Food chains, Zinc, Assay, Public health, Digestion, Path of pollutants, Measurement.

The Hanford plant, located on the Columbia River in southeastern Washington, for a number of years discharged small concentrations of radionuclides into the river with the once-through cooling water from the production reactors. Most of the radionuclides were short-lived activation products but a few nuclides persisted in the river all the way down to the Pacific Ocean. Small amounts of radionuclides from Hanford have been found in fin fish such as salmon, but by far the greatest concentrations occur in the various shellfish taken from sites near the mouth of the Columbia River. Two of these nuclides are biologically active (Zn65 and P32) and have been routinely measured in seafood. This study describes Zn65 in people living in two coastal communities in Oregon and Washington in the spring of 1970 and the fall of 1971, and the relationship between their body burdens and their seafood intake. The study was designed to obtain data about both the average for the communities and the maximum seafood consumers. (Houser-ORNL)
W72-13979

CONCENTRATIONS AND DISTRIBUTIONS OF LONG-LIVED FALLOUT RADIONUCLIDES IN OPEN OCEAN SEDIMENTS,
Woods Hole Oceanographic Institution, Mass.
V. E. Noshkin, and V. T. Bowen.
In: Symposium on the Interaction of Radioactive Contaminants with the Constituents of the Marine Environment, July 10-14, 1972, Seattle, Washington. Paper No. IAEA/SM-158/45. 21 p, 6 fig, 5 tab, 25 ref.

Descriptors: *Oceans, *Sediments, *Atlantic Ocean, *radioisotopes, *Strontium, *Cesium, Sampling, Cores, Depth, Analytical technique, Measurement, Movement, Sediment transport, Momentum transfer, Model studies, Fallout, Aquatic environment, *Path of pollutants, Water pollution sources.
Identifiers: *Mediterranean Sea, *Plutonium.

Analyses of deep open-ocean sediment cores from the North and South Atlantic and the Mediterranean Sea show the presence of Sr90, Cs137 and 239, Pu238 in measurable amounts distributed to depth within the sediment columns. Comparison of the quantities of these radionuclides accumulated in the sediments with either estimated integrated deliveries to the sea surface or the measured inventories in the overlying water masses has been used to estimate the residence times of the radionuclides in the water column. For Sr90 and Cs137 these computed residence times are orders of magnitude shorter than those estimated for the stable elements. Plutonium is removed from the water column significantly more rapidly than either Sr90 or Cs137. The ratio of Cs137 to Sr90 in the sediments is higher than that found in precipitation, suggesting that a larger fraction of ocean water Cs137 is associated with sedimenting particles than has been previously assumed. (Houser-ORNL)
W72-13980

THE GEOCHEMISTRY OF RADIOCARBON IN THE GULF OF MEXICO,
Texas A and M Univ., College Station. Dept. of Oceanography.
T. D. Mathews, A. D. Fredericks, and W. M. Sackett.
In: Symposium on the Interaction of Radioactive Contaminants with the Constituents of the Marine Environment, July 10-14, 1972, Seattle, Washington. Paper IAEA/SM-158/48. 22 p, 4 fig, 1 tab, 25 ref.

Descriptors: *Geochemistry, *Carbon radioisotopes, *Gulf of Mexico, *Nuclear explosions, Fallout, Distribution, Distribution pattern, Ocean circulation, Model studies, Hydrologic models, Sampling, Analytical techniques, *Path of pollutants, Water pollution sources.

This study was conducted to achieve a better understanding of the contemporary geochemistry of radiocarbon in the Gulf of Mexico and adjacent areas. Bomb C14 was found in various biological samples and samples of coral, atmosphere, and water as a result of efforts to map bomb C14 distribution in the Gulf. A circulation model for the western Gulf of Mexico was also proposed. Lateral transport from east to west and downward migration due to eddy diffusion were suggested as mechanisms of renewal of intermediate and deep water in the western Gulf. Residence times for these water masses were found to be 130 years and 270 years respectively. (Houser-ORNL)
W72-13981

ANOMALOUS TH228/TH232 AND TH230/232 ACTIVITY RATIOS IN BACKWATER SEDIMENTS ALONG THE WEST COAST OF INDIA.
Bhabha Atomic Research Centre, Bombay (India). Health Physics Div.
O. U. Joshi, and A. K. Ganguly.
In: Symposium on the Interaction of Radioactive Contaminants with the Constituents of the Environment, July 10-14, 1972, Seattle, Washington. Paper IAEA/SM-158/50. 14 p, 5 fig, 2 tab, 4 ref.

Descriptors: *Indian Ocean, *Coasts, *Assay, *Equilibrium, *Sediments, Harbours, Backwater, Sediment distribution, Distribution patterns, Interfaces, Radioisotopes, Geochemistry, Analytical techniques, *Path of pollutants, Water pollution sources.
Identifiers: Disequilibrium, Thorium (Natural), *Bombay (India).

Recently, remarkable disequilibrium between Th228 and Th232 activities has been observed in the top layer sediments of the backwaters along the Indian Coast. The Th228/Th232 activity ratios in Bombay harbour region (19 deg N, 73 deg E) and Kerala belt (8 deg to 10 deg N, 76 deg to 77 deg E) have been found to be in the range of 0.55 to 0.67, while this ratio is in the range of 2.00 to 2.19 along the rest of the West Coast of India between Bombay and Kerala region (19 deg to 15 deg E, 76 deg to 77 deg E). A geochemical study of these sediments is being carried out by leaching the samples with 5% EDTA at pH 3.00 in order to investigate the processes occurring on the surface and the distribution of natural thorium isotopes in backwater sediments. (Houser-ORNL)
W72-13982

RADIOACTIVE WASTE MANAGEMENT PRACTICES IN WESTERN EUROPE.
European Nuclear Energy Agency, Paris (France); and Organization for Economic Co-Operation and Development Paris (France).
For primary bibliographic entry see Field 05G.
W72-13983

ENVIRONMENTAL RADIOACTIVITY AT THE NATIONAL NUCLEAR RESEARCH CENTRE, PELENDABA. REPORT FOR THE YEAR 1970.
Atomic Energy Board, Pretoria (South Africa).
As. D. Van, and C. M. Vleggaar.
Available from NTIS, Springfield, Va., $3.00 copy/$0.95 mf. Publication No. PEL-216, September 1971. 21 p, 2 fig, 26 tab, 10 ref.

Descriptors: *Nuclear powerplants, *Effluents, *Radioactivity, *Measurement, *Monitoring, Fallout, Water pollution, Air pollution, Water pollution sources, Sediment, Path of pollutants, Assay, Radioisotopes, Water, Milk, Food chains, Public health, Strontium, Nuclear explosions, Testing, Africa.
Identifiers: *South Africa, Critical nuclide identification.

A revised environmental survey program, with the emphasis on monitoring of the critical paths of exposure of the general public, was introduced during the 1970 period. Results of determinations of both gross radioactivity and of individual nuclides in samples of fish and water (which are critical materials for liquid effluent releases) from the Hartbeespoort Dam and from the Crocodile River, are given and discussed. Results of gamma-spectrometric and Sr90 analyses of milk, the critical material for releases to the atmosphere, are presented. Results of regular investigations of the composition of effluent releases, which are performed in order to be able to detect possible other critical nuclides, are given. Levels of deposited and airborne activity from nuclear bomb tests are reported. (Houser-ORNL)
W72-13984

THE CONCENTRATIONS OF CADMIUM, COPPER, IRON, MANGANESE, MOLYBDENUM, NICKEL, VANADIUM AND ZINC IN PART OF THE TROPICAL NORTHEAST ATLANTIC OCEAN,
Liverpool Univ., (England). Dept. of Oceanography.
For primary bibliographic entry see Field 05A.
W72-13985

IODINE IN THE DEEP WATER OF THE OCEAN,
Hokkaido Univ., Sapporo (Japan). Dept. of Chemistry.
S. Tsunogai.
*Oceans, *Iodine, *Deep water, *Oxidation, *Chemical reaction, *Iodides, Distribution patterns, Profiles, Verticle migration, Depth, Sampling, Analytical techniques, Research and development, Cycles, Assay.

The distribution of iodine in the ocean was studied to ascertain the source of the iodine in deep water. Iodine in sea water was separated from iodate immediately upon sampling and both forms were determined. The concentration of iodide in the ocean is much smaller than that of iodate. The higher concentrations of iodide, however, were found in the surface water, near the bottom and in the water from some deep layers. The production rate of iodide from iodate in the bottom (or on the bottom) was estimated from the vertical distribution of iodide in the near-bottom water. This also gave the oxidation rate of iodide in the deep water. The production of iodide in the bottom water plays a fairly important role in the cycle of iodine in the ocean. Another source of iodide is presumed to be present in the deep water by taking into account the oxidation rate of iodide and the balance of iodide in the deep water. This source may be distributed locally and cause the higher concentrations of iodide found in some deep layers. (Houser-ORNL)
W72-13986

PERMISSIBLE ACTIVITY DISCHARGE INTO RECEIVING WATERS THROUGH RADIOACTIVE WASTE WATER FROM NUCLEAR POWER PLANTS (ZULASSIGE AKTIVITATSEINLEITUNG IN VORFLUTER DURCH RADIOAKTIVE ABWASSER AUS KERNKRAFTWERKEN),
For primary bibliographic entry see Field 05A.
W72-13987

RADIATION DATA, (SECTION II - WATER).
Environmental Protection Agency, Washington, D.C. Office of Water Programs.
For primary bibliographic entry see Field 05A.
W72-13988

RADIATION DATA, (SECTION II - WATER).
Environmental Protection Agency, Washington, D.C. Office of Water Programs.
For primary bibliographic entry see Field 05A.
W72-13989

STRONTIUM-90 AND CESIUM-137 IN CANNED SEAFOOD, TAIWAN, REPUBLIC OF CHINA, 1970-1971,
National Tsing Hua Univ., Hsinchu (Taiwan). Inst. of Physics.
For primary bibliographic entry see Field 05A.
W72-13990

HANFORD ATOMIC PRODUCTS OPERATION, JANUARY-DECEMBER 1969.
Battelle Memorial Inst., Richland, Wash.

Available from Sup Doc, GPO, Washington, D.C., 20402, for $0.50 per copy. Radiological Health Data and Reports, Vol 12, No 12, p 643-662, December 1971. 7 fig, 13 tab, 23 ref.

Descriptors: *Nuclear powerplants, Effluents, *Monitoring, *Radioactivity, Assay, Bioassay, Water pollution, Water pollution sources, Waste water disposal, Nuclear wastes, *Columbia River, Population, Food chains, *Path of pollutants.

Results are presented from routine sampling of biological materials and other media from surveillance and environmental monitoring around nuclear facilities at Hanford site. (Houser-ORNL)
W72-13991

THE BIODEGRADATION OF OIL IN SEAWATER FOR NAVAL POLLUTION CONTROL,
Naval Civil Engineering Lab., Port Hueneme, Calif.
T. B. O'Neill.
Available from NTIS, Springfield, Va 22151 as AD-740 757. Price $3.00 paper copy; $0.95 microfiche. Naval Civil Engineering Laboratory Technical Note N-1195, January 1972. 15 p, 1 tab, 15 ref.

Descriptors: *Oil spills, *Water pollution sources, *Sea water, *California, *Biodegradation, Microbial degradation, Marine microorganisms, Analytical techniques, Sampling, Beaches, Sands, Sediment, Bacteria, Fungi, Yeasts.

Natural oil seeps and accidental spills are common to the coast of Southern California. Field observations and laboratory tests support the view that marine microorganisms have the capacity to oxidize and thus degrade oil and derivatives of oil. Samples were collected from beach sand, sediment water, and tar deposits from 15 different sites of Southern California, where oil spills are chronic. The laboratory techniques of isolating and culturing hydrocarbon-oxidizing microorganisms are described. Included are cell density studies, where Navy fuels are used as the sole source of energy for microbes in the collected samples. To date, 62 hydrocarbon-oxidizing species, 48 bacteria, 10 fungi and 4 yeasts have been isolated. (Woodard-USGS)
W72-14012

CHEMICAL FACTORS THAT INFLUENCE THE AVAILABILITY OF IRON AND MANGANESE IN AQUEOUS SYSTEMS,
Geological Survey, Menlo Park, Calif.
J. D. Hem.
Geological Society of America Bulletin, Vol 83, No 2, p 443-450, February 1972. 8 fig, 12 ref.

Descriptors: *Iron, *Manganese, *Aqueous solutions, *Nutrients, *Oxidation-reduction potential, Hydrogen ion concentration, Water chemistry, Solubility, Colloids.
Identifiers: *Nutrient availability.

The principal factors affecting aqueous chemical behaviour of iron and manganese may be studied using Eh-pH diagrams designed to show predominant solute species, stable solid forms, and solubility. Simple systems which contain water and the metal, and more complicated systems which contain fixed total amounts of one to four additional anions are considered. Relatively small shifts in Eh or pH can greatly change the equilibrium solubility of the metals. Some complexes, especially ferric fluoride and probably organic ferrous and ferric complexes, may strongly influence the solubility of iron. Because iron and manganese have low solubilities in oxidizing systems at pH levels near or little above neutrality, small shifts in Eh or pH, and complexing effects, may be very important in making the metals available to plants and animals. (Knapp-USGS)
W72-14022

DESIGN AND SITING CRITERIA FOR ONCE-THROUGH COOLING SYSTEMS BASED ON A FIRST-ORDER THERMAL PLUME MODEL,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 05C.
W72-14030

PHOSPHORUS IN WASTEWATER,
New York State Dept. of Environmental Conservation, Albany. Environmental Quality Research and Development Unit.
L. J. Hetling, and I. G. Carcich.
Technical Paper Number 22, June 1972. 19 p, 3 fig, 6 tab, 51 ref.

Descriptors: *Detergents, *Water pollution, *New York, *Laundering, *Phosphorus, Data collections, Water pollution control, Water quality, Sewage, Water analysis, Analytical techniques, Phosphates, Soaps, Surfactants, Cleaning, Waste water (Pollution), Phosphorus compounds, Chemical wastes.

The current interest in the contribution of detergents toward increased phosphate levels in sewage led to this investigation in New York State. By analyzing sewage from homes using both a detergent and a control soap, it was found that the removal of phosphorus from detergents would result in the lowering of per capita phosphate levels in sewage by approximately 50% (from 3.2 lbs/capita/year to 1.6 lbs/capita/year). Composite samples were taken daily for three weeks for both the soap and the detergent. The samples were filtered with a 0.8-micron filter on site. They were then refrigerated and tested the next day. (Poertner)
W72-14046

THE NORTHERN MAINE REGIONAL TREATMENT SYSTEM, AROOSTOOK RIVER--PRESTILE STREAM, A PLAN FOR CLEAN WATER, SUMMARY REPORT.
Northern Maine Regional Planning Commission, Presque Isle.
For primary bibliographic entry see Field 05D.
W72-14049

MODEL STUDIES OF OUTFALL SYSTEMS FOR DESALINATION PLANTS (PART II - ESTUARY MODELS),
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
W. H. Bobb, R. A. Boland, Jr., and F. A. Hermann, Jr.
For sale by Supt. of Documents, U. S. Government Printing Office, Washington, D. C. 20402 for $1.50. Office of Saline Water Research and Development Progress Report No. 736, October 1971. 183 p, 149 plates. Contract 14-30-2656.

Descriptors: *Brine disposal, *Outlets, *Saline water, Water pollution control, Effluents, Desalination, *Model studies, Estuaries, *Dispersion, Path of pollutants.
Identifiers: Marine ecology, *Diffusers, *San Diego Bay, *Galveston Bay, *Delaware River.

Model studies were conducted to study the dispersion of heated waste brine from a desalting plant outfall. The existing fixed-bed models of San Diego Bay, Galveston Bay, and Delaware River located at the Waterways Experiment Station, Vicksburg, Mississippi, were chosen as typical estuaries. The objectives of the tests were to determine dispersion rates of the brine waste, to define the dynamic equilibrium distribution of the waste after a period time, and in case of the Delaware River model, to determine the effects of freshwater inflow on dispersion rates and equilibrium values. Results indicate: (a) in estuaries such as San Diego Bay, with low tidal current velocities and very little fresh water flow into the system, dispersion and flushing rates will be extremely slow, and the time to reach dynamic equilibrium will be comparatively long; (b) in large shallow estuaries such as Galveston Bay extreme care should be used in selection of an outfall site, since flow conditions in the immediate vicinity of the diffuser are highly significant in overall dispersion rates and thus tend to trap the effluent, (c) in estuaries similar to the Delaware River, which has appreciable freshwater discharge and tidal currents, sufficient mixing of the effluent will probably occur. (OSW abstract)
W72-14064

A STUDY OF THE DISPOSAL OF THE EFFLUENT FROM A LARGE DESALINATION PLANT,
Dow Chemical Co., Midland, Mich.
P. G. LeGros, E. F. Mandelli, W. F. McIlhenny, D. E. Winthrode, and M. A. Zeitoun.
Available from the National Technical Information Service as PB-206 020, $6.00 in paper copy, $0.95 in microfiche. Office of Saline Water Research and Development Progress Report No 316, January 1968. 491 p. Contract 14-01-0001-675 and 14-01-0001-1161.

Descriptors: *Brine disposal, *Brines, *Saline water, Effluents, *Waste disposal, *Desalination, Plants, Outlets, Cost estimates.
Identifiers: *Environmental model, Outfall location, Effluent dispersal, Intake-outfall locations, Environmental factors.

The effluent from any desalting plant will contain almost all of the materials dissolved in the feed solution in higher concentrations than in the feed and will contain any materials either intentionally or unavoidably added. The control of the intake and discharge of the large quantity of sea water is extremely important. Ten coastal strips were selected: five on the Atlantic Coast, two on the Gulf Coast and one on the West Coast. The oceanography, meterology, and marine topography of these selected coastal strips were studied from the available literature. An economic analysis was made of the effects of the effluents from large desalting plants operating on a hypothetical bay. Prelimary engineering designs and cost estimates of three intake-outfall configurations were made. The effects of interaction and of mixing of the various streams were considered. A criteria for the design of the outfall system was chosen. Recommendations are presented on the type, frequency, and intensity of pre-plant oceanographic and biological surveys and of post plant monitoring and verification surveys. (OSW abstract)
W72-14086

CONTAMINATION OF LETTUCE IRRIGATED WITH SEWAGE EFFLUENT,
Advisory Service, Exeter (England). Agricultural Development.
A. A. Nichols, P. A. Davies, K. P. King, E. J. Winter, and F. L. C. Blackwall.
J Hortic Sci, 46 (4): 425-433, Illus, 1971.
Identifiers: *Contamination, Irrigation, *Lettuce-D, *Sewage effluent, *E. coli.

Faecal contamination on lettuce growing in the open as indicated by the presence of Eschericbia coli I was demonstrated for up to 21 days after irrigation with sewage effluent, although the level of contamination usually decreased after 3-7 days. Recovery of other coliform bacteria gave parallel results; counts of these organisms and of other bacteria also indicated the persistence of more general pollution.--Copyright 1972, Biological Abstracts, Inc.
W72-14104

POLLUTANT CONCENTRATIONS IN ABNORMAL YOUNG TERNS FROM LONG ISLAND SOUND,
American Museum of natural History, New York.
For primary bibliographic entry see Field 05C.
W72-14134

THE FISH FAUNA OF THE ESTUARINE AREA OF THE RHINE AND MEUSE RIVERS,
Delta Inst. of Hydrobiological Research, Yerseke (Netherlands).
K. F. Vaas.
Biol Jaarb, 36: 115-128, Illus, Maps, 1968, English summary.
Identifiers: Estuarine conditions, *Fish fauna, Gobio-Gobio, *Meuse River, Netherlands, Water pollution sources, Pomatoschistus-Microps, *Rhine River.

The river system leading the greater part of the water of the rivers Rhine and Meuse towards the North Sea via the rivers Hollands Diep and Haringvliet, can be divided into 5 areas according to composition of its fish fauna. In the mouth of the Haringvliet only marine elements are found. In the Haringvliet proper, some freshwater elements penetrate. The Hollands Diep is characterized by a mixture of the most tolerant marine and freshwater species. In the rivers carrying water derived from the Meuse, freshwater species are well

developed, better than in those rivers which carry the water of the Rhine, because the Rhine is polluted and its salinity is increased. The river gudgeon Gobio gobio (L) was more frequently encountered in the rivers carrying Rhine water. Four spp. originating in the sea penetrate the rivers far into the freshwater zone beyond the eastern border of the area investigated and the body Pomatoschistus microps (Kryer) spawns in the area. These 5 spp. were found throughout the whole area, but the goby was less numerous in the mouth of the Haringvliet.--Copyright 1972, Biological Abstracts, Inc.
W72-14153

DETERMINATION OF THE RESERVE OF AVAILABLE PHOSPHATES IN IRRIGATED SOILS (IN RUSSIAN),
M. K. Agishev.
Tr Kaz Nauchno-Issled Inst Zemled, 9/10, 61-76, 1970.
Identifiers: Accumulation, Buckwheat-D, *Fertilizers, Irrigated soils, *Minerals, *Phosphates, Phosphorus, Spring, Tomatoes-D, Wheat-M.

The application of mineral and organic fertilizers over a number of years resulted in the accumulation of available P in the soil. Regular manuring with N and K increased the available phosphate. The amount of P extracted from the soil by a 1% solution of ammonium carbonate was low because of the secondary precipitation of soluble phosphates. The phosphorization of irrigated soils in Kazakhstan is indicated.--Copyright 1972, Biological Abstracts, Inc.
W72-14169

THE HYDROLOGICAL CONDITIONS OF AMBARO BAY (NORTHWESTERN MADAGASCAR): CONTRIBUTION TO THE STUDY OF A TROPICAL EUTROPHIC BAY, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Nosy Be (Madagascar). Centre Oceanographique (ORSTOM) de Nosy-Be.
For primary bibliographic entry see Field 05C.
W72-14182

ON NITROGEN FORMS IN DEW OR FROST WATER: II. ON THE CHANGES OF NITROGEN DIOXIDE IN THE AIR, (IN JAPANESE),
Ibaraki Univ., Mito (Japan). Faculty of Agriculture.
Kyozo Nagai.
Sci Rep Fac Agric Ibaraki Univ. 18: 9-16. Illus. 1970. English summary.
Identifiers: *Air pollution, Dew, Frost, *Humidity, *Nitrogen dioxide, *Temperature.

The mutual effects of temperature and humidity on chemical changes of nitrogen dioxide introduced in the air is analyzed.--Copyright 1972, Biological Abstracts, Inc.
W72-14186

INORGANIC PHOSPHATE FRACTIONS IN CALCAREOUS SOILS IN RELATION TO MOISTURE AND INCUBATION PERIOD,
Ranchi Univ. (India).
For primary bibliographic entry see Field 02G.
W72-14189

THE PERSISTENCE OF ENDOSULFAN IN SURFACE WATER,
Rijksinstituut voor de Volksgezondheid, Utrecht (Netherlands).
P. A. Greve.
Meded Fac Landbouwwet Rijksuniv Gent. 36 (1): 439-447. Illus. 1971. (Engl. summ.).
Identifiers: *Adsorption, *Endosulfan, Ferric hydroxide, Gel, Water pollution sources, Path of pollutants, Filtration.

The degradation of endosulfan in surface water is a complicated process in which presence and type of silt and bacterial, pH and O2 content of the water are important variables. Only healthy surface water can degrade endosulfan quickly. Relatively small changes in the environment can significantly disturb the degradation processes. For the purification of surface water to drinking water the removal of endosulfan is accomplished most easily by adsorption techniques. River silt readily adsorbs endosulfan; more than 80% of the endosulfan present can be removed by simple filtration. Better adsorption is brought about by using ferrichydroxyde-gel and charcoal. Ferrichydroxide-gel catalyzes the hydrolysis of endosulfan in the adsorbed phase.--Copyright 1972, Biological Abstracts, Inc.
W72-14193

CERTAIN FEATURES OF RESPIRATORY METABOLISM OF PLANTS UNDER CONDITIONS OF AN INCREASING WATER DEFICIENCY, (IN RUSSIAN)
Kazan State Univ., (USSR).
For primary bibliographic entry see Field 03F.
W72-14195

REACTION OF SURFACE-APPLIED SUPERPHOSPHATE WITH SOIL: I. THE FERTILIZER SOLUTION AND ITS INITIAL REACTION WITH SOIL,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
C. H. Williams.
Aust J Soil Res. 9 (2): 83-94. Illus. 1971.
Identifiers: Capillarity, Diffusion, *Fertilizers, Leaching, Minerals, *Phosphates, *Soils, Solution, Suction.

The P and Ca contents of the fertilizer solution in contact with moist soil were similar to those of the metastable triple-point solution (MTPS) produced when an excess of monocalcium phosphate is shaken with water. The average P, Ca, and S concentrations of saturated aqueous extracts of superphosphate at 20 degree C were 4.0 M, 1.5 M and 0.023 M respectively. The pH of these extracts ranged from 1.60 to 1.92 (0.15-0.47 units higher than that of MTPS). The S content of the fertilizer solution was generally .02-.01 of the P content. In the absence of leaching both diffusion and capillarity were involved in the movement of phosphate from superphosphate particles into moist soil. The fertilizer solutes entered the soil mainly by diffusion but on soils of low moisture content the increase in pore size of the fertilizer particles, which resulted from the dissolution of monocalcium phosphate, led to a reversal of the suction gradient between soil and particles which caused movement of some of the fertilizer solution into the soil by capillarity. Leaching of superphosphate applied to dry soils by rainwater is likely to yield fertilizer solutions which have higher pH, lower P and Ca contents, and higher S contents than the saturated solutions arising from superphosphate particles in contact with moist soil. When synthetic fertilizer solution reacted with acid soils the rate of removal of phosphate an Ca from solution depended upon the phosphate sorption capacity of the soil. In calcareous soil the CaCO3 played a major part in phosphate precipitation. Appreciable amounts of Fe and particularly Al were dissolved from each of the soils studied by the synthetic fertilizer solution to give solutions which, on standing, readily formed precipitates of phosphate. Both sulfate and organic S compounds were displaced from the acid by the fertilizer solution but, in the calcareous soil, sulfate was coprecipitated with the phosphate. (See also W72-14199) --Copyright 1972, Biological Abstracts, Inc.
W72-14198

REACTION OF SURFACE-APPLIED SUPERPHOSPHATE WITH SOIL: II. MOVEMENT OF THE PHOSPHORUS AND SULPHUR INTO THE SOIL,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.

Aust J Soil Res. 9 (2): 95-106. Illus. 1971.
Identifiers: Leaching, Phosphates, *Phosphorus, *Soils, Sorption, Sulfate, *Sulfur.

Phosphate moving into moist soil from particles of surface-applied superphosphate penetrated a hemispherical zone beneath the particle. The size of this zone and the distribution of phosphate through it were governed by the phosphate sorption capacity of the soil, the size of the particle, and the soil moisture. In calcareous soils the CaCO3 content was important in determining phosphate penetration. Phosphate from superphosphate particles penetrated rapidly into moist (100 cm tension) soil during the 1st 5 or 6 days after contact and continued to move through the soil at a decreasing rate throughout the whole of an 8-wk period. Movement of sulfate from surface-applied superphosphate, into soil was governed by the particle size of the fertilizer and the soil moisture, both of which influenced the rate of solution of CaSO4. The distribution of the sulfate through the soil was influenced by the sulfate sorption capacity of the soil. The rate of penetration of sulfate from surface-applied superphosphate into calcareous soil was considerably less than when the superphosphate was applied to acid soils. Leaching influenced the movement of both P and S into the soil. It caused distortion of the hemispherical distribution of phosphate beneath superphosphate particles, resulting in deeper penetration of phosphate below the particles and smaller horizontal movement away from them. It also greatly enhanced the solution of sulfate, especially from small particles. The optimum particle size of superphosphate will vary from soil to soil, but a 2.5 mm diameter particles is likely to satisfy a wide range of soil and environment conditons. (See also W72-14198)--Copyright 1972, Biological Abstracts, Inc.
W72-14199

STATISTICAL STUDIES ON THE RELATION BETWEEN NITRIFICATION AND SOIL TEMPERATURE AND SOIL MOISTURE,
Deutscher Wetterdienst, Brunswick (West Germany).
For primary bibliographic entry see Field 02G.
W72-14200

5C. Effects of Pollution

ESTURINE ECOSYSTEMS AND HIGH TEMPERATURES,
North Carolina Water Resources Research Inst., Raleigh.
B. J. Copeland, and H. Lee Davis.
Available from the National Technical Information Service as PB-211 808, $3.00 in paper copy, $0.95 in microfiche. North Carolina Water Resources Research Institute, Raleigh, Report No 68, June 1972 (UNC-WRRI-72-68). 90 p, 39 fig, 9 tab, 47 ref. OWRR A-041-NC (1).

Descriptors: *Water pollution effects, *Heated water, *Water temperature, *Water quality standards, *Esturaries, *Thermal pollution, *North Carolina, Nutrients, Sewage effluents, Eutnophication, Algae, Cyanophyta, Chlorophyta, Metabolism, Nekton, Benthos, Biomass.
Identifiers: *Pamlico River estuary, Photosynthesis/respiration ratios.

Responses of estuarine community structure, respiration and production to added heat, sewage and their combination were investigated. Plastic pools containing transplanted ecosystems from South Creek Estuary, N. C. were used. Tempera-

ture replication achieved. Temperature in the heated pools was regulated at 5 C (9F) above that of the ambient pools. Thermal treatment increased nutrient regeneration rates, yielding slightly higher algal biomass; although, seasonal differences were more significant. Gross community productivity was regulated by ammonia, light, and temperature levels and total respiration by temperature and primary productivity. Sewage addition substantially increased ammonia levels, particularly during the winter. Community metabolism responded positively to thermal treatment, but not to sewage treatment. Thermal treatment and the combination of sewage and thermal treatments increased the photosynthesis/respiration ratios (P/R) during spring and summer, but decreased the P/R when temperature was limiting during winter. Temperature had very little effect on phytoplankton composition during the spring. Blue-green algae and coccoid green algae dominated in the heated and sewage-treated pools during summer. Nekton and benthic increased to higher biomass in heated pools during spring and achieved a lower biomass in the heated pools during summer than in the ambient pools. No significant differences were observed during winter among heated and ambient pools. Sewage addition did not substantially alter patterns between heated and ambient systems. Oysters, bay clams and widgeon grass reached higher biomass in heated pools during winter than in ambient pools. A flow-through experiment was conducted during the 1971 summer to test more realistic estuarine conditions. Results were substantially the same as obtained under quiescent conditions.
W72-13636

THE PLANKTON OF LAKE GARDNO NEAR THE BALTIC SEA DURING THE SUMMER SEASON,
Polish Academy of Sciences, Pszczna. Hydrobiological Station.
Jerzy Strzelecki, and Tadeusz Poltorak.
Acta Hydrobiol. 13 (3): 269-294. Illus. 1971. Pol. and Russ. summ.
Identifiers: Aphanizomenon-Flos-Aquae-Gracile, Baltic Sea, *Gardno Lake, Lyngbya-Limnetica, Microcystis aeruginosa, Plankton, Poland, Season, Summer, *Tintinnopsis-Ovalis, *Cyanophyta, *Eutrophication.

The eutrophic Lake Gardno is seasonally supplied by the water of the Baltic Sea. The occurrence of 257 taxons of algae and 69 taxons of animals was noted. Of the class Bacillariophyceae about 40% of species were found, assigned to halophilous and brackish forms. Cyanophyta occurred in masses (69.7%) with the predominant species Microcystis aeruginosa, Lyngbya limnetica, and Aphanizomenon flos-aquae f. gracile. In the zooplankton the most numerously represented were Protozoa (78.4%), Tintinnopsis ovalis being the predominant form. Littoral and benthic species prevailed among algae and animals, this being related with the shallowness of the water and overgrowth of the lake with higher plants.--Copyright 1972, Biological Abstracts, Inc.
W72-13637

PROCEEDINGS, FOURTEENTH CONFERENCE ON GREAT LAKES RESEARCH.

Proceedings of Conference held at University of Toronto, Ontario, April 19-21, 1971. International Association for Great Lakes Research, Ann Arbor Michigan. 834 p.

Descriptors: *Great Lakes, *Lake Superior, *Lake Erie, *Lake Huron, *Lake Michigan, *Lake Ontario, Biology, Limnology, Geology, Meteorology, Hydrology, *Eutrophication, Lakes, Thermal pollution, Lake sediments, Nutrients, Phytoplankton, Primary Productivity.

The Fourteenth Conference on Great Lakes Research was co-hosted by Canada Centre for Inland Waters at Burlington and the Great Lakes Institute at the University of Toronto. There were 132 papers presented on the topics of biology, chemical limnology, geology, meteorology and hydrology, physical limnology and general. (See also W72-13641 thru W72-13665.
W72-13640

EVIDENCE FOR THE EUTROPHICATION OF LAKE ONTARIO FROM THE SEDIMENTARY DIATOM SUCCESSION,
Waterloo Univ. (Ontario). Dept. of Biology.
H. C. Duthie, and M. R. Sreenivasa.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 1-13. 5 fig, 3 tab, 20 ref. Wisconsin Dept. of Natural Resources D. J. Project F-83-R.

Descriptors: *Eutrophication, *Lake Ontario, *Diatoms, *Sediments, Bioindicators, Succession, Cores, Plankton, Paleolimnology, Palynology, Systematics, Great Lakes.
Identifiers: *Fossil diatoms, Achnanthes, Navicula, Stephanodiscus, Melosira, Tabellaria fenestrata, Cyclotella, Mysis relicta, Fragilaria.

Interpretation of the paleolimnology of Lake Ontario based on sedimentary diatom succession is valid if distortion is reasonably consistent and if differential preservation of various species is consistent down the core. Of five sediment cores, only one had fossil diatoms preserved below 90 cm. Well preserved diatoms were found to a depth of 277 cm and are described; below this they were disintegrated and are not included. Seventy-three diatom taxa were identified from this core from a deep east-central area. Counts per sample varied from 227 to 1294. Most individuals belonged to a few planktonic species, but there were low numbers of many nonplanktonic species. Many of the dominant plankters in the Great Lakes are eurytopic; others are more typical of oligotrophic environments. The proportion of diatoms characteristic of oligotrophy decreases in upper samples. At 19-21 cm there was an increase in numbers of all major species. This interval includes the horizon of Ambrosia pollen, about 150 year BP, correlated with forest clearance and settlement. Since then Melosira italica subsp. subarctica has been gradually replaced in importance by M. islandica, suggesting cultural eutrophication. (See also W72-13640) (Jones-Wisconsin)
W72-13641

INFLUENCES OF THERMAL EFFLUENTS UPON AQUATIC PRODUCTION IN LAKE ONTARIO,
State Univ., of New York, Albany. Dept. of Biological Sciences.
M. W. Fenlon, D. C. McNaught, and G. D. Schroder.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 21-26. 2 fig, 4 tab. 9 ref. DACW 35-69-C-0050.

Descriptors: *Thermal pollution, *Aquatic productivity, *Lake Ontario, Daphnia, Predation, Eutrophication, Secondary Productivity, Primary productivity, Standing crops, Nuclear powerplants, Water pollution effects, Outlets, Zooplankton, Fish harvest.
Identifiers: Bosmina, Daphnia retrocurva, C-14, Ceriodaphnia, Cyclops bicuspidatus.

To test the systems approach to the effect of heat and to utilize techniques to control primary production, information was assembled by measuring primary and secondary production off the Niagara Mohawk plant, Nine Mile Point, Lake Ontario while the plant was under construction, and again while it was in limited operation. Primary productivity rates for the planktonic algae were measured using standard C-14 techniques. Additions of heat have increased the standing crop of Bosmina 25.0 times and Daphnia retrocurva 1.2 times in the overall study area. Adjacent to the outfall these same populations increased 123.8 and 2.4 times respectively. At the same time primary production was not significantly affected. Although temperature alone can explain such increases, possibly these zooplankters were also supported by increased algal resources. Turbulence around the outfall may be important, both in creating turbidity, thus decreasing photosynthesis, and in resuspending detrital zooplankton foods. As Bosmina and Daphnia have responded to thermal additions with increased standing crops and likely increased production, the concept of turning these herbivores over more rapidly by harvesting their fish predators appears worthwhile. Power companies may improve the quality of the lakeside by supporting commercial fishermen. (See also W72-13640) (Jones-Wisconsin)
W72-13642

THE DECLINE OF THE LARGE ZOOPLANKTER, LIMNOCALANUS MACRURUS SARS (COPEPODA: CALANOIDA), IN LAKE ERIE,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
John E. Gannon, and A. M. Beeton.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 27-38. 4 fig., 41 ref.

Descriptors: *Zooplankton, *Copepods, *Lake Erie, *Distribution, Great Lakes, Niches, Seasonal Hypolimnion, Dissolved oxygen, Predation, Fish, Crustaceans, Daphnia, Temperature, Oxygen sag, Eutrophication.
Identifiers: *Limnocalanus macrurus Sars, *Calanoida.

The systematics, distribution, and ecology of Limnocalanus macrurus are recorded in literature, especially relative to Lake Erie. A large calanoid copepod, part of glacial relict fauna, differs from other copepods by its large size. It is important food for many fish species. In 1929, it was quite abundant in central and eastern basins of Lake Erie but was present in shallow western basin only during winter and spring. Migration may have taken place from Lake Huron through the St. Clair and Detroit Rivers during winter and spring. Evidently Limnocalanus underwent seasonal dispersal in Lake Erie, being confined to the cold hypolimnetic waters of eastern and central basins during summer, but distributed throughout the lake from late fall through early spring. In 1957 Limnocalanus was extremely rare in the central and eastern basins but was still present in the western basin during the spring. During extensive sampling in 1967 no Limnocalanus was found and only a few individuals were observed in 1968. Factors involved in decline of Limnocalanus in Lake Erie are discussed with hypolimnetic dissolved oxygen depletion and predation by planktivorous fish as probabilities. (See also W72-13640) (Jones-Wisconsin)
W72-13643

AVAILABILITY OF PHOSPHORUS FOR CLADOPHORA GROWTH IN LAKE MICHIGAN,
Wisconsin Univ., Milwaukee. Dept. of Botany; and Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
Chang-Kwei Lin.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 39-43. 4 fig, 15 ref.

Descriptors: *Phosphorus, *Cladophora, *Plant growth, *Lake Michigan, Algae, Phosphates, Hydrolysis, Storm water, Rainfall, Waste water (Pollution), Eutrophication, Water pollution sources, Nutrients.

Identifiers: Cladophora glomerata, Milwaukee Harbor (Wisconsin), Polyphosphates, Orthophosphates.

The profuse growth of the alga, Cladophora, in the Great Lakes has seriously curtailed shoreline recreation. Sampled from Milwaukee Harbor and from sites along Lake Michigan north of the harbor, Cladophora glomerata was analyzed for extractable inorganic orthophosphate and for its ability to hydrolyze polyphosphates. Those algae growing in the harbor area showed a consistently high value of surplus stored phosphorus and the values decreased as the distance from the harbor increased. Longer, denser, and greener Cladophora was found near the harbor than from more distant sites. Samples from all locations taken after heavy rainfalls contained substantial increases in stored phosphorus. Storm sewer overflow and increased river discharge due to precipitation could sporadically provide excessive supplies of phosphorus. Great variation in ability to hydrolyze polyphosphates was found in algae sampled from different locations. The yield of orthophosphates from polyphosphates was inversely proportional to the amount of surplus stored phosphorus in the algae. The algae growing near the harbor accumulated phosphate phosphorus while the algae growing at greater distance were concurrently phosphorus starved, perhaps they adapted to obtain their phosphorus primarily from hydrolysis of polyphosphate. (See also W72-13640) (Jones-Wisconsin)
W72-13644

EFFECT OF MINERAL PARTICULATES ON MICROBIAL DEGRADATION OF SOLID ORGANIC MATERIALS,
Ohio State Univ., Columbus. Coll. of Biological Sciences.
Patricia A. McCabe, and James I. Frea.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 44-51. 6 fig, 30 ref. OWRR-A-006-(6) Ohio and B-013-OHIO (6).

Descriptors: *Bacteria, *Degradation (Decomposition), *Organic matter, Actinomycetes, Nutrients, Enzymes, Lake Erie, Chemical properties.
Identifiers: *Mineral particulates, Kaolin.

Considering that the mechanisms by which particulates enhance microbial nutrition can be employed to accelerate decomposition of complex solid materials, study was made of interaction of mineral particles with cell surfaces, mineral particles with solid organic material, and enzymes adsorbed to mineral particles with solid substrates. In an aqueous medium, strong interactions occur between mineral particulates and the mycelium of a streptomycete, solid proteinaceous substrates, and the extracellular enzyme of the streptomycete. Adherence of kaolin to cell and substrate surfaces was demonstrated. Kaolin-adsorbed enzyme was assayed by its ability to release azo dye conjugated to collagen, and to degrade collagen structure. In a cell free system, kaolin-enzyme and kaolin-substrate interaction effects two enhancements of enzyme activity. Addition of kaolin to dilute enzyme solutions is a rapid method of concentrating active enzyme. Adherence of enzyme-coated kaolin to degradable material places the enzyme in immediate contact with substrate. These results support the concept of mineral particulate mediation of substrate degradation by microbial exoenzymes and help to explain how aquatic microorganisms salvage the nutrients released from bulk substrate by extracellular enzymes. These data also suggest the mechanism responsible for decomposition of resistent organic materials. (See also W72-13640) (Jones-Wisconsin)
W72-13645

VARIATIONS IN OXYGEN CONSUMPTION BY AQUATIC MACROPHYTES IN A CHANGING ENVIRONMENT,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
Archie J. McDonnell.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 52-58. 2 fig, 2 tab, 15 ref. OWRR B-016-PA (3).

Descriptors: *Oxygen, *Aquatic plants, *Respiration, Primary productivity, Temperature, Nutrients, Eutrophication, Photosynthesis, Dissolved oxygen, Analytical techniques, Self-purification, Methodology.
Identifiers: *Oxygen consumption, Potamogeton crispus, Elodea canadensis.

Respiratory response of selected aquatic plants to changes in oxygen concentration, temperature, and exogenous nutrient additions are evaluated and criteria developed for evaluating effects a varying plant respiration rate can have on estimations of primary productivity in eutrophic systems and waste assimilation capacity of streams. Test species were run in continuous flow and batch type respirometers. Sampling sites were a nutrient-rich stream section receiving effluent from a secondary sewage treatment plant and an unenriched section supported solely by watershed drainage. Consumption rates were dependent on temperature, plant maturity, oxygen concentration of test water, and level of enrichment at growth site. Batch data were found to give results comparable to continuous flow data when analyzed according to the suggested empirical relationship. Existence of a variable respiration pattern in aquatic ecosystems can lead to overestimation of reaeration coefficients in stream oxygen balance studies, when these conefficients are calculated from field observations of dissolved oxygen concentrations, and to an underestimation of net primary productivity and daily respiration. Methodology is presented to estimate primary productivity in aquatic ecosystems from observations of diurnal variation of dissolved oxygen incorporating a variable community respiration rate. (See also W72-13640) (Jones-Wisconsin)
W72-13646

THE ICHTHYOFAUNA AND FLORA OF LAKE ST. LOUIS ON THE ST. LAWRENCE RIVER NEAR MONTREAL, QUEBEC: GENERAL FEATURES AND RECENT CHANGES,
Quebec Dept. of Tourism, Montreal. Fish and Game Wildlife Service Research Lab.
Gerard Pageau, Yvon Gravel, and Lucien Levesque.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 79-89. 3 tab, 47 ref.

Descriptors: *Fish populations, *Rooted aquatic plants, *St. Lawrence River, Great Lakes, Eutrophication, Water pollution effects, St. Lawrence Seaway, Urbanization.
Identifiers: *Lake St. Louis (Quebec), Hydrocharis morsus-ranae.

Increase of aquatic vegetation and changes in fish populations, directly related to accelerated eutrophication of the Great Lakes system, are reported and literature reviewed pertaining to fish and aquatic vegetation, mainly in Lake St. Louis, near Montreal, Quebec. Although some characteristic fishes of Lake St. Louis show little or no variation in their populations during the past 30 years, many species have changed. This condition may be related chiefly to a major spread of vegetation, higher climatic temperatures as well as greater transportation and deposit of silt and clay. New fish migration paths, influenced by gradually warming air, contribute to changes in fish communities. Slight changes have occurred in the floral species of Lake St. Louis over the last 30 years. Only a small number of new floristic elements were found: of the recent additions, Hydrocharis morsus-ranae (frog-bit) was introduced from Europe in the Arboretum of the Division of Botany in Ottawa from where it soon escaped and has spread down the Ottawa River to Lake St. Louis and the St. Lawrence River and now reaches Lake St. Peter. The extent of its aggressiveness is unknown thus its dispersal should be watched. (See also W72-13644) (Jones-Wisconsin)
W72-13647

DISTRIBUTION OF CHLOROPHYLL AND ITS RELATION TO PARTICULATE ORGANIC MATTER IN THE OFFSHORE WATERS OF LAKE MICHIGAN,
Oklahoma Univ., Norman. Dept. of Zoology; and Michigan Univ., Ann Arbor. Great Lakes Research Div.
Andrew Robertson, Charles F. Powers, F. Charles, and Jeanne Rose.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 90-101. 1 fig, 10 tab, 21 ref. PHS Grant WP-00311.

Descriptors: *Chlorophyll, *Organic matter, *Lake Michigan, *Standing crops, Phytoplankton, Detritus, Seston, Biomass, Distribution patterns.
Identifiers: Particulate organic matter.

To obtain information on the extent of the relationship between amounts of particulate organic matter and phytoplankton standing crop in Lake Michigan, a series of lake samples at three offshore stations were analyzed for particulate organic matter and for chlorophlls a, b and c. Chlorphyll a was the predominant pigment with chlorophyll c sometimes making up an appreciable fraction while chlorophyll b was always negligible. The seasonal distribution of chlorphyll a was unimodal with the peak in early summer. At a station on the west side, off Milwaukee, the chlorophyll a had a higher average than at the other two stations. A slightly greater average for clorophyll a was found in samples from the depth range from 0-25 meters than in samples from below 25 meters. Distributional patterns for particulate organic matter were quite similar to those for chlorophyll a. Estimates of seasonal changes in the ratio of chlorophyll a to organic matter in living phytoplankton indicated a peak in phytoplankton activity during summer. Living phytoplankton usually makes up an appreciable fraction of the seston in Lake Michigan as strongly suggested by estimates of detritus and other evidence. (See also W72-13640) (Jones-Wisconsin)
W72-13648

NUTRIENTS, PHYTOPLANKTON PRODUCTIVITY AND SPECIES COMPOSITION AS INFLUENCED BY UPWELLING IN LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
Claire L. Schelske, Eugene F. Stoermer, and Laurie E. Feldt.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 102-113. 7 fig, 5 tab, 5 ref. AEC C00-2003-7.

Descriptors: *Upwelling, *Nutrients, *Phytoplankton, *Primary productivity, Systematics, Lake Michigan, Silica, Nitrates, Hydrogen ion concentration, Diatoms, Cyanophyta, Chlorophyta, Eutrophication, Phosphorus, Physiococemical properties, Limiting factors.
Identifiers: Grand Haven (Mich.), Limiting nutrients.

July-September 1969 studies of onshore and offshore stations near Grand Haven, Michigan, indicated a large amount of variability in biological, chemical and physical conditions in the nearshore

environment, which lessened offshore. Maximum rates of primary productivity and highest cell counts were found after bottom water was upwelled at the inshore station. This water had greater concentrations of silica and nitrate nitrogen and lower values of pH than were found in the mixed layer during stratification and presumably provided nutrients for increased phytoplankton productivity and maintenance of diatoms as the dominant components of the phytoplankton. No upwelling was observed at the offshore station in late August and early September. Blue-green and green algae comprised a significant fraction of the phytoplankton assemblages in samples collected in August and September due to nutrient-poor water at the offshore station in late August to early September and at the inshore station in late September. Nutrients, particularly silica, supplied from upwelling at the inshore station in August were the main factor in maintaining diatoms as dominant taxa in the phytoplankton assemblages at the inshore station. (See also W72-13640) (Jones-Wisconsin)
W72-13649

PHYTOPLANKTON ASSEMBLAGE DIFFERENCES AT INSHORE VERSUS OFFSHORE STATIONS IN LAKE MICHIGAN, AND THEIR EFFECTS ON NUTRIENT ENRICHMENT EXPERIMENTS,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
E. F. Stoermer, C. L. Schelske, and L. E. Feldt.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 114-118. 2 tab, 4 ref. AEC COO-2003-6.

Descriptors: *Phytoplankton, *Lake Michigan, *Nutrients, Eutrophication, Nitrogen, Phosphorus, Silica, Inhibitors, Limiting factors, Dominant organisms, Biological communities.
Identifiers: Cyclotella stelligera, Fragilaria crotonensis, Anabaena flos-aquae.

During the past two years experiments on chemical enrichment of natural waters as a tool for determining limiting element concentrations and for assessing probable effects of nutrient pollution have been carried out in Lake Michigan. Several cases occurred in which nutrient addition produced changes in phytoplankton standing crop quite different, and sometimes opposite, from the expected. The two most striking examples of grossly different effects produced by identical treatments in experiments at stations separated by only 5.5 km are given. The in situ enclosure experiments at these stations were enriched with nitrogen, phosphorus and silica. One experiment ran from July 17-28 1969 and the other from August 26-September 8, 1969. Possible explanations are suggested: some factor in the physiological history of the populations severely limited reproductive potential; exhaustion of some critical nutrient not added in the experiment; the presence of some inhibitory or toxic factor. The third possibility appears most likely. The differences in effect appeared to be related to species composition of the assemblages initially sampled. Results indicate that enrichment experiments utilizing natural phytoplankton assemblages, even under near natural conditions, should be interpreted with caution. (See also W72-13640) (Jones-Wisconsin)
W72-13650

DEVELOPMENT OF A THEORETICAL SEASONAL GROWTH RESPONSE CURVE OF CLADOPHORA GLOMERATA TO TEMPERATURE AND PHOTOPERIOD,
State University of New York, Buffalo, Dept. of Biology; and State Univ. Coll., Buffalo. Great Lakes Lab.
J. R. Storr, and R. A. Sweeney.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 119-127. 4 fig, 4 tab, 14 ref.

Descriptors: *Algae, *Seasonal, *Cladophora, *Temperature, *Photoperiodism, Great Lakes, Model studies, Nutrients, Plant growth, Analytical techniques, Water temperature.
Identifiers: *Cladophora glomerata, Growth curves.

Laboratory and field investigations ascertained effects of heat on Cladophora growth when this plant is cultured under spring and summer photoperiods. Results indicated that at the level of nutrients present, optimum growth was around 18C. Low growth levels occurred at the low temperature range (14.5C) but results were inconclusive. In the upper temperature range, growth cessation appeared at about 25C. Growth response to photoperiod levels in the experiments appeared to be exponential in character while the growth response curves generated by the temperature experiments were very similar in form at the different levels of photoperiod. A family of temperature related growth curves was constructed for different photoperiods throughout the May-October period. Recorded lake water temperature data was plotted on these curves for the same period and a seasonal growth response curve was generated relating seasonal photoperiod and temperature. This resultant plot appeared to be in close agreement with observed Cladophora growth throughout the season. A theoretical growth curve was also plotted using this technique and the temperature data for the same area and time period. The theoretical model of growth response rate may be useful in predicting probable seasonal growth and approximate standing crop, especially in localized areas around thermal discharges. (See also W72-13640) (Jones-Wisconsin)
W72-13651

PCBS IN FISH FROM THE MILWAUKEE REGION,
Wisconsin Univ., Madison. Water Chemistry Program.
Gilman D. Veith, and G. Fred Lee.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 157-169. 3 fig, 3 tab, 20 ref.

Descriptors: *Fish, *Chlorinated hydrocarbon pesticides, Lake Michigan, Aroclors, Toxicity, Pesticides, Water pollution effects, DDE, DDT, Sewage.
Identifiers: *PCB, *Chlorobiphenyl, *Milwaukee (Wis.), Milwaukee River (Wis.), Chlorinated biphenyls.

Fish from the Milwaukee River and nearshore (Wisconsin) region of Lake Michigan were examined for the presence of chlorobiphenyl mixtures to relate composition and quantities of these mixtures to known PCB sources or areas of the river which have been contaminated with PCB-containing wastes. The results of the investigation provided spectrochemical confirmations of the presence of chlorobiphenyls (PCBs) and estimates for their composition and concentration. The composition of the PCBs in fish varied with location of capture and its relation to PCB sources. Fish from the upper Milwaukee River contained from 2.3 to 15.4 micrograms/g of Aroclor 1260 equivalent. Major sources of Aroclors 1242 and 1248 were found in the city of Milwaukee, and the fish in this region contained 405 micrograms/g Aroclor 1248 equivalent. Lake Michigan fish contain residues resembling Aroclor 1254 at levels of approximately 18.6 to 22.4 micrograms/g. These results point out several interesting aspects of this study of the Milwaukee River. The first is the variability of the 'apparent PCB mixtures' and the second is the lack of any correlation between the PCB concentration in the fish and the size or lipid content of the fish. (See also W72-13640) (Jones-Wisconsin)
W72-13652

CHLOROPHYLL A - TOTAL PHOSPHORUS RELATIONSHIPS IN LAKE ERIE,
Ontario Water Resources Commission, Rexdale (Ontario).
Thomas G. Brydges.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 185-190. 5 fig, 4 ref.

Descriptors: *Chlorophyll, *Phosphorus, *Lake Erie, Nitrogen, Algae, Inorganic compounds, Standing crops, Limiting factors, Eutrophication.

Since 1966 an extensive water quality monitoring program has been conducted on the Great Lakes. Some lake water samples have been analyzed for chlorophyll a as a routine since 1967 to estimate algal standing crops. Examination of chorophyll results for 1967, 1968, and 1969 is presented with particular reference to their relationships with inorganic nitrogen and phosphorus concentrations. In 1967 average chlorophyll a and total phosphorus concentrations at 87 open lake stations (three to five measurements at each) were directly proportional. High total phosphorus and relatively lower chlorophyll a concentrations characterized the Detroit, Raisin, and Maumee River stations. Lake stations included the Western Basin and a five mile wide band along north shore from Point Pelee to Buffalo. There were no apparent trends between chlorophyll a and inorganic nitrogen concentrations. The concentrations of chlorophyll a and total phosphorus measured in 1968 and 1969 were directly proportional. Eight stations in Western Basin were sampled for nine successive days in July 1968. In 1969, 97 stations (422 measurements) were sampled over the full length of the lake. That phosphorus is an algal growth limiting factor in Lake Erie is concluded from these extensive empirical observations. (See also W72-13640) (Jones-Wisconsin)
W72-13653

AN INTENSIVE BIOCHEMICAL SURVEY OF WESTERN LAKE ERIE,
Ontario Water Resources Commission, Rexdale (Ontario).
T. G. Brydges.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 191-197. 2 fig, 2 tab, 9 ref.

Descriptors: *Physicochemical properties, *Phosphorus, *Iron, *Chlorophyll, Surveys, Lake Erie, Water quality, Inorganic compounds, Water pollution, Conductivity, Nitrates, Eutrophication.
Identifiers: *Western Lake Erie, Detroit River, Maumee Bay.

To determine the extent, causes and consequences of the wide variations in water quality with time observed in earlier surveys, eight stations in western Lake Erie were samped at two depths for nine consecutive days in July 1968. Thirteen chemical and four bacteriological tests were made on each sample. The total phosphorus and total iron concentrations were directly related and it is postulated that they coprecipitated removing the extremely high phosphorus load from solution. This results in less total growth than might be expected in the absence of iron inputs. Numerical comparison of Western Lake Erie and Lake Sebasticook with respect to both loadings and concentrations of phosphorus and the resulting chlorophyll a concentrations support this premise. The average chlorophyll a concentrations for the nine day survey were lowest in the Detroit River mouth and up to five times greater in the other parts of the Western Basin. The exact cause of the low values in the Detroit River, where nitrogen and phosphorus are present in high concentrations, was not determined. Chlorophyll a concentrations and bacterial numbers were inversely related suggesting that a symbiotic relationship is not present. (See also W72-13640) (Jones-Wisconsin)
W72-13654

Department of Energy Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.

In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 198-210. 1 fig, 4 tab, 7 ref.

Descriptors: *Chemical properties, *Model studies, *Lakes, *Water quality, Metals, Ions, Phosphates, Detergents, Great Lakes, Equilibrium.
Identifiers: *Nitrilotriacetate, Chemical equilibrium, Metal ions.

General use of tri-sodium nitrilotriacetate as a substitute for penta-sodium tri-polyphosphate in detergents would likely lead to the appearance of significant quantities of nitrilotriacetate in the Great Lakes. The speciation at equilibrium in a model lake water containing nitrilotriacetate is reported and is derived primarily from straightforward calculations with the aid of a computer program available in the literature. The speciation in a 'normal' lake water model, that is, one containing no nitrilotriacetate, has also been calculated, both for the pH 6-9. For total nitrilotriacetate concentrations in the range 1 x 10 to the minus 8th power to 2 x 10 to the minus 6th power moles/1 the copper (II) complex accounts for most of the nitrilotriacetate while in the range 2 x 10 to the minus 5th power to 2 x 10 to the minus 4th power moles/1, most is present as the calcium (II) complex. The major iron complexes are given. Significant amounts of many metal-ions exist in hydrolyzed forms, and as carbonate or sulphate complexes. The existence of mercury (II) in solution is described. These results should be considered only in the light of the discussion given. They probably provide a reasonably sound indication of the most important chemical species in a well-mixed lake, close to equilibrium, whose composition approaches that assumed for the calculations. (See also W72-13640) (Jones-Wisconsin)
W72-13655

RADIOACTIVITY IN LAKE MICHIGAN WATER AND BIOTA VICINITY OF BIG ROCK POINT NUCLEAR REACTOR, 1960-69,

Michigan Dept. of Natural Resources, Lansing. Bureau of Water Management.
Carlos M. Fetterolf, Jr., and D. JamesSeedburger.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 211-218. 7 fig, 3 tab, 9 ref.

Descriptors: *Radioactivity, *Lake Michigan, *Biota, Nuclear reactors, Radioactive fallout, Surface waters, Great Lakes, Radioactive wastes, Gamma rays, Zinc radioisotopes, Food chains.
Identifiers: *Big Rock Point (Mich.), Nuclear weapons tests, Beta-radioactivity.

Consumers Power Company's Big Rock Point Reactor near Charlevoix on Lake Michigan became critical on September 12, 1962. On-site and area radioactivity monitoring programs for gross beta-radioactivity have been carried out by the company with various enforcement agencies at the discharge and at remote control stations. Background levels, which were similar at all stations prior to criticality, fluctuated due to atmospheric fall-out from nuclear weapon testing. Since criticality, radioactivity of aquatic biota at control stations has gradually decreased to near the minimum preoperation levels while radioactivity of biota in the discharge vicinity has gradually increased to near, or slightly above, the preoperational peaks caused by weapon testing. Surface water radioactivity in the reactor vicinity is similar to that at other Michigan locations. Because of the increasing beta-radioactivity in biota samples, a gamma scan was run on samples collected October 7, 1969. To date, the only specific isotope data received were on Zn-65; it does not result from fission, but is a neutron activation product resulting from impurities in the system. Zn-65 discharges should be lower because in 1968 components releasing Zn-65 were replaced. (See also W72-13640) (Jones-Wisconsin)
W72-13656

THE EFFECT OF DDT AND DIELDRIN UPON C-14 UPTAKE BY IN SITU PHYTOPLANKTON IN LAKES ERIE AND ONTARIO,

Department of Energy Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
Walter A. Glooschenko.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 219-223. 6 fig, 12 ref.

Descriptors: *Pesticides, *DDT, *Dieldrin, *Phytoplankton, Carbon radioisotopes, Lake Erie, Lake Ontario, Adsorption, Agricultural runoff, Algae, Food chains, Chlorinated hydrocarbon pesticides, Fisheries.

Since previous work with chlorinated hydrocarbons has been mainly restricted to marine species of phytoplankton, this study investigated the effects of DDT and dieldrin upon C-14 uptake by natural phytoplankton communities in Lakes Ontario and Erie. In situ studies were performed, but the concentrations of DDT and dieldrin used were higher than normally found in the Great Lakes. The lowest concentration used, 1 ppb, is at least 200 times that found in situ. If depression of carbon fixation by phytoplankton in the Great Lakes is occurring, it will be negligible. Possibly agricultural runoff in local areas may be much higher in pesticide concentration which may lead to DDT or dieldrin limiting carbon fixation in localized inshore areas. The adaptation of algae to pesticides needs consideration. The most serious hazard resulting from pesticides in water is biological concentration; while algae themselves may not be seriously affected, they may concentrate high amounts of pesticide by active uptake on surface adsorption and transfer it to higher trophic levels. Concentration and transfer of these two compounds to higher trophic levels is of major concern to Great Lakes fisheries. (See also W72-13640) (Jones-Wisconsin)
W72-13657

ELECTRODIALYSIS: A METHOD FOR EXTRACTING AVAILABLE NUTRIENTS IN GREAT LAKES SEDIMENTS,

Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
A. L. W. Kemp, and Alena Murdrochova.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 241-251. 10 tab, 25 ref.

Descriptors: *Electrodialysis, *Nutrients, *Great Lakes, *Lake sediments, Phosphates, Nitrates, Nitrites, Ammonia, Lake Ontario, Inorganic compounds, Analytical techniques, Manganese.
Identifiers: Hamilton Harbor (Ontario), Nutrient extraction.

The electrodialysis method for extraction of potentially available phosphorus, nitrate, nitrite, and ammonium ions from Great Lakes sediments, under mild extraction conditions, was evaluated, compared with other procedures used by soil scientists, and results presented for the major sediment types from Lake Ontario. No data are presently available on the forms of P in the Great Lakes sediments. Organic N and fixed ammonium N are the predominant forms of N in Lake Ontario sediments. Electrodialysis extracts less than 5% of the total P or N from Lake Ontario sediments, excepting glacial clays. Less than 1% P and N was extracted from eutrophic Hamilton Harbor muds. No relation is established between electrodialytic P and quantity of P that might be available to plants, organisms, and the lake waters. Evidence is presented that electrodialytic N is 1/4th to 1/7th that of N potentially available to plants, organisms and water from the Great Lakes silty clay muds. Electrodialysis is considered to extract conservatively P and N from the Great Lakes sediments in amounts that might be available to the waters if inputs of P and N were drastically reduced in the Great Lakes. (See also W72-13640) (Jones-Wisconsin)
W72-13658

HYPOTHESIS FOR DISSOLVED OXYGEN DEPLETION IN THE CENTRAL BASIN HYPOLIMNION OF LAKE ERIE,

Lake Erie Basin Office, Fairview Park, Ohio.
Conrad Kleveno, O. Braidech, E. Thomas, and Philip E. Gehring.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 252-255. 1 fig, 1 tab.

Descriptors: *Dissolved oxygen, *Hypolimnion, *Lake Erie, Benthic flora, Algae, Light penetration, Plankton, Nutrients, Biochemical oxygen demand, Inorganic compounds, Thermal stratification, Diatoms, Epilimnion, Eutrophication.
Identifiers: *Lake Erie Central Basin, *Oxygen depletion.

In 1968 a rapid depletion of dissolved oxygen in the hypolimnion of the central basin of Lake Erie was observed from 8.2 mgl on August 6 to 1.9 on August 8. In the summer of 1969 a study was initiated to determine the rate and describe the mechanics of dissolved oxygen depletion in the hypolimnion in the basin. The decline of the dissolved oxygen was gradual during early summer, but in August the rate of depletion increased rapidly. The death and decomposition of benthic algae, Tribonema utriculosum and Oedogonium may explain this relatively sudden decline. These algae were found growing in profusion at the bottom during the summer of 1969. It is postulated that they are killed by a reduction in light caused by an increase of plankton in overlying waters. The increased plankton is caused by an increased vertical circulation of nutrients when the lake begins to cool. The death of the benthic algae results in a tremendous increase in biochemical oxygen demand in hypolimnion waters, thus the rapid depletion of dissolved oxygen. (See also W72-13640) (Jones-Wisconsin)
W72-13659

FIVE TRACE ELEMENTS AND VITAMIN B-12 IN CAYUGA LAKE,

Cornell Univ., Ithaca, N.Y. Dept. of Natural Resources.
Edward L. Mills, and Ray T. Oglesby.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 256-267. 4 fig, 3 tab, 27 ref.

Descriptors: *Spatial distribution, *Trace elements, *Vitamin B, Cobalt, Copper, Zinc, Lead, Cadmium, Phytoplankton, Nutrients, Limnology, Eutrophication, Limiting factors, Seasonal.
Identifiers: *Cayuga Lake (N.Y.).

Possible stimulatory or depressing effects of the trace elements cobalt, copper, zinc, lead, cadmium, and vitamin B-12 on phytoplankton in Cayuga Lake, New York, prompted this study leading to the hypotheses relative to their ecological significance. A large proportion of the trace elements entering Cayuga Lake through its tributaries is in the particulate form. Cayuga Lake appears to concentrate cadmium but toxic effects of both cadmium and lead seem unlikely since their levels are so low; however, limited experimental evidence indicates that lead may act as either a photosynthetic stimulant or respiratory inhibitor, at least for a short period of time. Cobalt, copper, and zinc may be limiting to phytoplankton production in Cayuga

Lake during late summer. Two in situ experimental studies and a comparison of the concentrations measured with those reputed to be necessary for optimal growth, suggest this hypothesis. Seasonal patterns of change in the soluble fraction of these trace metals show a marked summer decrease which would also substantiate the argument. Although vitamin B-12 did not stimulate photosynthesis in the experimental phase of this study, levels are low compared with those measured elsewhere. (See also W72-13640) (Jones-Wisconsin)
W72-13660

RADIONUCLIDE CONCENTRATIONS NEAR THE BIG ROCK POINT NUCLEAR POWER STATION,
Argonne National Lab., Ill.
Donald M. Nelson, Gerald P. Romberg, and William Prepejchal.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 268-276. 2 fig, 5 tab, 1 ref.

Descriptors: *Radioisotopes, *Lake Michigan, *Nuclear powerplants, Gamma rays, Sediments, Zinc radioisotopes, Cobalt radioisotopes, Cesium radioisotopes, Aquatic life, Hazards, Fish, Tritium, Radioactivity, Radiation, Radioactive wastes.
Identifiers: *Big Rock Point (Mich.), Charlevoix (Mich.), Cesium radioisotopes, Uranium, Thorium.

A survey was made during 1970 of gamma-ray emitting nuclides present in biota near the Big Rock Point power reactor on Lake Michigan which has been in operation since 1963. The radionuclide concentrations, therefore, may be at or near their equilibrium values for most isotopes. Reactor-produced Zn-65, Cs-137, Cs-134, and Co-60 were measurable at distances of up to a few kilometers along the shore in crayfish, water snails, Potamogeton, Ranunculus, Chara, Cladophora, and periphyton. In general, concentrations at 1 km are less than 1/10th those found in the same organism at the discharge point, with somewhat higher concentrations being found toward the east (into little Traverse Bay). Water and bottom samples were found to be quite variable; concentrations in bottom sands being somewhat lower than concentrations in organisms living at the same place. Several small fish samples were taken from the discharge channel. While the levels of gamma-ray emitting radionuclides near the plant are sufficiently high to be useful as tracers, they are well within safe limits. Caution should be exercised in extrapolating these values to other species, to these species at other times, or to large members of these same species. (See also W72-13640) (Jones-Wisconsin)
W72-13661

A CASE OF NUTRIENT ENRICHMENT IN AN INSHORE AREA OF GEORGIAN BAY,
Ontario Water Resources Commission, Rexdale (Ontario).
Denis M. Veal, and M. F. P. Michalski.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 277-292. 4 fig, 5 tab, 25 ref.

Descriptors: *Eutrophication, *Nutrients, Lake Huron, Effluents, Water quality, Phosphorus, Phytoplankton, Sewage treatment, Nitrogen, Physochemical properties, Diatoms, Algae, Cladophora, Productivity, Water pollution, Standing crops.
Identifiers: *Georgian Bay (Ontario).

Surveys and public complaints indicated that phytoplankton populations in Penetang Harbor, Georgian Bay, were reaching excessive levels. A gradation of water quality conditions not unlike those of Lake Erie were revealed in a study of the Penetanguishene to Waubaushene area in 1969. Major emphasis was placed on an evaluation of nitrogen and phosphorus concentrations, standing stocks of phytoplankton and algal productivity and an assessment of nutrient loading. Mean total phosphorus concentrations ranged from 0.02 mg/l (as P) over most of the study area to 0.03 mg/l in Midland Bay and 0.06 mg/l in the southern end of Penetang Harbor. Phytoplankton values increased with higher total phosphorus concentrations. The Midland and Penetang sewage treatment plants were responsible for approximately 53% of the net phosphorus leading. The flushing rate as well as exhange of high quality water from the open lake will promote rapid recovery when significant municipal nutrient sources are eliminated. It is evident that municipal waste discharges to small bays along the Upper Great Lakes will require an improved degree of treatment, including nutrient removal, in order to preserve water quality and to maintain high recreational potential of the shorelines. (See also W72-13640) (Jones-Wisconsin)
W72-13662

COMPREHENSIVE ABATEMENT PROGRAM FOR AN EUTROPHIC LAKE,
O'Brien and Gere, Syracuse, N.Y.; and Syracuse-Onondaga County Dept. of Public Works, N.Y.
Peter E. Moffa, F. J. Drehwing, John M. Karanik, and John J. Hennigan, Jr.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 690-705. 3 fig, 3 tab, 2 ref, 1 appendix.

Descriptors: *Pollution abatement, *Planning, *Eutrophication, *Lakes, New York, Costs, Recreation, Industrial wastes, Sewage treatment, Sewerage, Municipal wastes, Programs, Economic impact, Monitoring, Cost-benefit analysis, Storm water, Sampling, Sediments, Data collections, Chemical properties, Combined sewers, Nutrients.
Identifiers: *Onondaga Lake (New York).

To restore Onondaga Lake, near Syracuse, New York to a quality which would allow the highest recreational uses, anticipated expenditures will exceed $75 million and will include the following: Surveys and analyses of industrial wastes in the drainage basin; in-depth study of the ecology; feasibility studies of joint municipal-industrial wastewater treatment; construction of a new tertiary treatment plant to handle combined wastes; continuous monitoring of the lake before and after installation of the new treatment plant; determination of feasibility of treating storm waters at 96 overflow points; and economic evaluation of the impact on the community of the restoration program. The most significant evaluations made during the lake study were the influences of chemical gradients on stratification, bottom sediment sources of phosphorus, and oxygen demanding materials, and effects of input materials and their distribution on the water quality. Lake waters are strongly stratified due to high calcium chloride concentrations and the autumnal overturn took two months during the study period. As a result of the high calcium concentration and its tendency to maintain an over-saturation condition with respect to hydroxyapatite, calcite, and fluorapatite, it was determined that the lake sediments would remain an effective phosphorus trap and dredging should not be considered. (See also W72-13640) (Auen-Wisconsin)
W72-13663

A SURVEY OF HOUSEWIVES' ATTITUDES,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
Margaret Sinclair.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971. p 706-719. 6 tab, 10 ref.

Descriptors: *Surveys, *Attitudes, *Detergents, Water pollution, Phosphates, Social impact, Social participation, Statistical methods, Soaps, *Canada.
Identifiers: *Housewives, *Hamilton (Ontario).

The attitudes of 211 housewives in Hamilton, Ontario, concerning water pollution generally, and the detergent debate specifically, were studied. Detergent use patterns, as well as the socio-economic status of the respondent were determined. The survey disclosed that the strongest variable was education, particularly the education of the respondent's husband. Women whose husbands were more highly educated were more concerned about water pollution, more aware of the detergent debate, more likely to have seen the list of phosphate contents and to have heard about phosphate legislation, more willing to ban phosphates, more likely to have changed detergents, and more willing to pay a higher amount for a non-phosphate detergent. The occupation and income variables were also highly correlated with attitudes. In general, the housewives appear more concerned about water pollution than they are aware of its sources and abatement methods. While this concern may not be translated into action, any anti-pollution measures by government should enjoy wide support, if Hamilton housewives are representative of the population at large. (See also W72-13640) (Jones-Wisconsin)
W72-13664

SYMPOSIUM: PUBLIC INVOLVEMENT IN THE WATER MANAGEMENT PROBLEMS IN THE GREAT LAKES,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Centre for Inland Waters.
Terrence R. Lee, Thomas E. Borton, Ralph O. Brinkhurst, Desmond, Connor, and Kenneth E., McElroy, Jr.
In: Proceedings 14th Conference on Great Lakes Research, University of Toronto, Ontario, April 19-21, 1971, p 731-737. 6 ref.

Descriptors: *Social participation, *Decision making, *Great Lakes, Governments, Water resources, New York, Pennsylvania, Maryland, Legislation, Institutions, Administration, Planning.
Identifiers: *Public participation, Susquehanna River, Toronto (Ontario), New Brunswick (Canada), St John River (New Brunswick).

How to develop most effective public involvement in resource and environmental quality planning is discussed. Examples are drawn from the experiences of the Great Lakes Basin Commission, the Susquehanna Study of the Corps of Engineers, the Canada-New Brunswick St. John River study, and the non-governmental public involvement institution, Pollution Probe, based at the University of Toronto. There is demonstrably a need to develop a genuine partnership between the water resource planner and the water resource public. A suggested ideal form of a public participation program is to: identify the local social and cultural mores, carefully select and train a field staff specifically to handle the public participation program, collect preliminary data on community institutions and attitudes, establish an information exchange between the people and the planners, test alternative planning solutions through public discussions and workshop sessions, and provide political decision makers with consequences or alternative courses of action. Toronto Pollution Probe has also developed an environmental law association and makes available legal services for environmental cases on a low or no fee basis. (See also W72-13640) (Jones-Wisconsin)
W72-13665

SYNCHRONIZATION OF CELL DIVISION IN ESCHERICHIA COLI BY ELEVATED TEMPERATURES: A REINTERPRETATION,
Tel-Aviv Univ. (Israel). Dept. of Microbiology.

R. Lomnitzer, and E. Z. Ron.
Journal of Bacteriology, Vol 109, No 3, p 1316-1318, March 1972. 3 fig, 7 ref.

Descriptors: *E. coli, *Cultures, *Inhibition, Thermal stress, Temperature, Cytological studies, Amino acids.
Identifiers: *Synchronization, *Methionine, *Cell division.

Synchronization of cell division in E. coli exposed to elevated temperatures can be prevented if methionine is present during heat shock. Cells were grown at 37 degrees C on a minimal medium containing glucose, arginine, and thymine (methionine starvation). Cell numbers were determined by viable counts and by total cell counts in a Petroff-Hausser counting chamber after fixation with 6 percent formaldehyde. Exposure to elevated temperatures involved a transfer of 25-30 ml of culture to a 43.8 plus or minus 0.2 degree C water bath. Synchronization of cell division resulted from exposure to these elevated temperatures. That the amino acid methionine prevented synchronous growth at these temperatures suggested the elimination of endogenous methionine at higher temperatures which might be the reason for synchronization of cell division. (Long-Battelle)
W72-13666

HYPERTROPHIC GROWTH,
Microbiological Research Establishment, Salisbury (England).
E. O. Powell.
Journal of Applied Chemistry and Biotechnology, Vol 22, No 1, p 71-78, January 1972. 5 fig, 15 ref.

Descriptors: *Cultures, *Deficient elements, *Mathematical models, *Eutroplication, Bioassay, Growth rates, Microorganisms, E. coli, Growth stages, Magnesium, Water pollution, Pollutant identification, Aerobic bacteria, Yeasts, Model studies, Mathematical studies.
Identifiers: *Hypertrophic growth, *Substrate utilization, Enrichment, Substrates, Bacillus subtilis, Aerobacter aerogenes, Chemostats, Culture media, Candida utilis.

A tentative mathematical model is presented of the microbiological hypertrophic growth phenomenon. Hypertrophic growth of a microbial organism occurs when two different media are used, and one is enriched with glutamic acid. Hypertrophic growth is illustrated by a series of mathematical equations of some simple specific assumptions using a chemostat culture of Bacillus subtilis growing under magnesium limitation and in a steady state as the representative microorganism for experimental study. (Byrd-Battelle)
W72-13668

A QUANTITATIVE COMPARISON OF PIGMENT EXTRACTION BY MEMBRANE AND GLASS-FIBER FILTERS,
Kent State Univ., Ohio. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05A.
W72-13673

NOTES ON THE AVIFAUNA OF THE MARSHY AREA OF PIERREPONT-SISSONNE (LAONNOIS-AISNE) II,
W. Schipper.
Alauda. Vol 39, No 3, p 204-208. 1971.
Identifiers: *Birds, Population, *Environmental effects, Buzzards, Ducks, Fauna, France, Marshes, Pesticides, Pheasants, Plants, Poplar D, Rabbits.

A reinventory (April-June 1970) of the avifauna of the Pierrepont-Sissone region revealed 75 spp. of nesting birds. An extreme moisture in the spring probably caused the low density of ducks and buzzards and the reduced productivity of pheasants. The productivity of the buzzards definitely suffered from the low density of rabbits and young plants. Various human-caused dangers menacing this region were also noted. They include an extensive amount of fishing, pesticide use, airplane noise, the cutting of reeds to make pathways before hunting season, and most of all, poplar plantings which increase in surface area each year transforming a marsh with a varied, rich flora and fauna into an artificial forest with a poor flora and fauna.--Copyright 1972, Biological Abstracts, Inc.
W72-13678

DEVELOPMENT OF LACTIC ACID BACTERIA DURING EARLY STAGES OF FERMENTATION IN FISH SILAGE,
Lantbrukhogskolan, Uppsala (Sweden). Dept. of Microbiology.
For primary bibliographic entry see Field 05A.
W72-13683

NUTRIENT STUDIES IN TEXAS IMPOUNDMENTS,
Texas Univ., Austin. Dept. of Environmental Health and Engineering.
V. H. Huang, J. R. Mase, and E. G. Fruh.
December 1970. 39 p., 10 fig, 11 tab, 6 ref. OWRR B-040-TEX (4).

Descriptors: *Phytoplankton, *Algae, *Nutrients, *Nitrogen fixation, Lakes, Nitrogen, Phosphorus, Iron, *Texas, Laboratory tests, Carbon radioisotopes, *Cyanophyta, Eutrophication, Water pollution effects.
Identifiers: *Lake Travis, *Lake Livingston, Field measurements, Carbon-14 measurements, Acetylene reduction measurements, Nutrient enrichment tests.

Blue-green algae became dominant in late summer 1970 in Lake Livingston on the Trinity River. Preliminary batch laboratory nutrient enrichment tests indicated nitrogen to be the limiting nutrient. Laboratory and in-situ carbon- 14 measurements substantiated the conclusions that nitrogen was the limiting nutrient. In-situ acetylene reduction measurements indicated that the nitrogen fixation rate was unmeasurable in August but was 0.74 millimicro moles C2H4/mg protein/ min in September. The rate of nitrogen fixation significantly increased with the addition of phosphorus after 2 weeks of incubation. Blue-green algae were also one of the dominant groups of phytoplankton in Lake Travis on the Colorado River. Preliminary batch laboratory nutrient enrichment tests indicated that nitrogen, phosphorus, and iron all could be limiting phytoplankton growth. Laboratory carbon- 14 analyses indicated iron to be most critical but field tests were inconclusive. In-situ acetylene reduction measurements indicated that no nitrogen fixation was occurring. Fixation in the laboratory did occur after 33 days of incubation of samples enriched with phosphorus and phosphorus and iron with the latter sample showing a higher rate. However, this rate was significantly lower than that found in Lake Livingston samples. (Galwardi-Texas)
W72-13692

LIMNOLOGICAL STUDIES OF BIG BEAR LAKE, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
E. G. Pearson, and G. A. Irwin.
Geological Survey Open-file Report, February 2, 1972. 18 p, 9 fig, 6 tab, 17 ref.

Descriptors: *Limnology, *Lakes, *California, Chemical properties, Physical properties, Biological properties, Water temperature, Dissolved oxygen, Nutrients, Phytoplankton, Chemical analysis, Data collections.
Identifiers: *Big Bear Lake (Calif).

Big Bear Lake, California, exhibited seasonal changes in physical, chemical, and biological variables from June 1968 to June 1969. Dissolved-oxygen concentrations were depressed during the summer resulting in anaerobic conditions near the bottom of the lake. Water temperature decreased with depth in spring and summer, although classical thermal stratification was not observed. The nutrient standing crop was sufficient to maintain two distinct seasonal phytoplankton blooms. There were phytoplankton growth periods during the winter of 1968 and the summer of 1969, but the maximum populations were not excessive. Big Bear Lake exhibited periods of biochemical stress symptomatic of organically enriched lakes; however, no attempt was made to determine the magnitude or rate of the eutrophicational processes. (Woodard-USGS)
W72-13739

OSMOTIC STABILITY AND SODIUM AND POTASSIUM CONTENT OF L-FORMS OF STREPTOCOCCUS FAECALIS,
Wadsworth General Hospital, Los Angeles, Calif.
J. Z. Montgomerie, G. M. Kalmanson, E. G. Hubert, and L. B. Guze.
Journal of Bacteriology, Vol 110, No 1, p 624-627, May 1972. 4 fig, 6 ref.

Descriptors: *Osmosis, *Stability, *Cytological studies, Streptococcus, Aerobic bacteria, *Sodium, *Potassium, Cultures, Flame photometry, Digestion, Environmental effects, Pathogenic bacteria, Radioactivity techniques.
Identifiers: *Streptococcus faecalis, Sucrose, Hydrocarbons, Culture media, Survival.

A stable L-form of Streptococcus faecalis has been conditioned to grow in media without an osmotic stabilizer. The ability of this L-form to survive at different osmolalities and intracellular levels of Na and K ions has been compared with the L-form from which it was derived growing in media containing 0.5 M sucrose. L-form colonies and their stable derivatives were grown on BHI agar and BHI agar plus 0.5 M sucrose, respectively. Cells were obtained by centrifugation. Extracellular volume was determined with serum albumin (I-131). Na and K content were measured by flame photometry. The stable L-form of S. faecalis (T sub 53) was transferred in media containing decreasing concentrations of sucrose until it grew in medium without added osmotic stabilizer. This L-form (designated T sub 53I) was compared with T sub 53 from which it was derived. The survival of these two L-forms suspended at different osmalalities showed that maximal survival for T sub 53I was 350 to 400 milliosmolal and for T sub 53 was 900 to 1,000 milliosmolal. Both peaks were at the osmolality of their growth media. Measurement of intracellular potassium and sodium showed that the concentration of these ions was reduced in T sub 53I. (Long-Battelle)
W72-13764

EFFECT OF TEMPERATURE ON THE RESPIRATION AND CYTOCHROMES OF AN EXTREME THERMOPHILE,
Montana State Univ., Bozeman. Dept. of Botany and Microbiology.
G. A. McFeters, and J. T. Ulrich.
Journal of Bacteriology, Vol 110, No 2, p 777-779, May 1972. 3 fig, 8 ref.

Descriptors: *Heat resistance, *Thermophilic bacteria, *Respiration, Aquatic bacteria, Aerobic bacteria, Spectrophotometry, Enzymes, Physiological ecology, Water temperature, Hot springs, Cultures, Dissolved oxygen.
Identifiers: Thermus aquaticus, *Cytochrome a, Cytochrome b, Cytochrome c.

An obligate aerobic, extreme thermophilic bacterium resembling Thermus aquaticus was isolated from a hot spring in Yellowstone National Park.

Since it grew optimally at 72 degrees C but repeatedly failed to grow anaerobically, the effect of temperature on respiration and the cytochromes was studied. Respiration was measured at different temperatures by using a Gilson differential respirometer. The culture was grown to mid-exponential phase in complete medium at the temperatures that were used for the oxygen uptake experiments (50, 60, and 70 C). Cells were grown to late-exponential phase at 50, 60, and 70 C in the complete medium, and their cytochrome content was determined. The difference spectra at ambient temperature were determined by using a Hitachi Perkin-Elmer model 356 spectrophotometer, and the cytochrome concentrations were estimated. The rate of oxygen uptake in the thermophile at 70 C was three times greater than at 50 C. Cytochromes a, b, and c were present in cells grown at 50, 60, and 70 C. The content of these electron transport system elements remained relatively constant as the growth temperature was raised. The concentration of dissolved oxygen also had no effect on the concentrations of respiratory enzymes. That the bacterium grew better at higher temperatures was postulated to be the result of increased availability of cofactors and increased dehydrogenase activity. (Long-Battelle)
W72-13765

LOSS OF VIABILITY BY STAPHYLOCOCCUS AUREUS IN ACIDIFIED MEDIA. I., INACTIVATION BY SEVERAL ACIDS, MIXTURES OF ACIDS, AND SALTS OF ACIDS,
Wisconsin Univ., Madison. Dept. of Food Science.
T. E. Minor, and E. H. Marth.
Journal of Milk and Food Technology, Vol 35, No 4, p 191-196, April 1972. 2 fig, 5 tab, 10 ref.

Descriptors: *Viability, *Acidity, Anions, Temperature, Water pollution, Pollutant identification, Aerobic bacteria, Hydrogen ion concentration, Organic acids.
Identifiers: *Staphylococcus aureus, *Culture media, Acetic acid, Citric acid, Hydrochloric acid, Lactic acid, Phosphoric acid, Survival, Mineral acids, Fate of pollutants.

Loss of viability by Staphylococcus aureus (100,000,000 cells per milliliter) was investigated after 24 hr of incubation at 37 C in Trypticase Soy broth acidified with acetic, citric, hydrochloric, lactic, and phosphoric acids. When the organism was exposed to the medium adjusted with hydrochloric acid to pH values of 5.2-3.6, 90-99.99 percent of the cells were inactivated. Acetic, lactic, and phosphoric acids were more active against S. aureus than was hydrochloric, whereas citric was equivalent to hydrochloric. Mixtures of lactic and hydrochloric acids inactivated more cells than did either acid alone but mixtures of other acids with hydrochloric, while superior to hydrochloric acid itself, offered no apparent advantage over the use of single acids. The undissociated acid molecule was responsible for enhanced inactivation of cells by partially dissociated acids since anions of these acids had no effect on cell survival. Cells were more susceptible to inactivation by hydrogen ions at high incubation temperatures (45 C) and when the number of bacteria was low. Cells of S. aureus were most sensitive to the effects of hydrogen ions between the 12th and 24th hr during a 120-hr incubation. (Byrd-Battelle)
W72-13777

CHRONIC EXPOSURE OF RATS TO METHYL MERCURY IN FISH PROTEIN,
Massachusetts Inst. of Tech., Cambridge. Dept. of Nutrition and Food Science.
P. M. Newberne, O. Glaser, L. Friedman, and B. R. Stillings.
Nature, Vol 237, No 5349, p 40-41, May 5, 1972. 3 b, 12 ref.

Descriptors: *Toxicity, *Mercury, Foods, Animal pathology, Animal physiology, Reproduction, Fish, Protein, Laboratory tests, Urine, Diets, Heavy metals, Bioassay, Food chains.
Identifiers: *Methyl mercury, *Bioaccumulation, Histopathology, Mercury compounds, Rats, Tissue, Biological samples, Red hake, Utophycis chuss, Blood, Kidneys, Liver, Brain.

A two-year investigation has been completed on the effects of chronic exposure of rats to methyl mercury via diets of fish protein. Fish protein concentrate (FPC), extracted from red hake, was incorporated into a balanced, semisynthetic diet so as to supply 20 percent protein. This diet was fed to 30 male and 30 female rats and to their offspring totaling 5 generations. Measurements were recorded for all physical, reproductive, and feeding aspects for all generations. Two control diets of casein or lab chow were fed to similar groups of rats. Detailed histopathological studies were carried out on blood, liver, brain, kidney and urine samples. The control diets contained from 0.01-0.06 ppm total Hg while the FPC diet contained an average of 0.22 ppm total Hg, 90 percent of which was methyl mercury. In spite of greater concentrations of Hg in the tissues of the rats fed FPC, no gross, histologic or other noticeable effects were noted in the rats, the growth and reproductive performance of which were comparable with the performance of those fed control diets. (Mackan-Battelle)
W72-13780

HORIZONTAL AND VERTICAL DISTRIBUTION OF THE INTERSTITIAL HARPACTICOID COPEPODS OF A SANDY BEACH,
Marine Biological Association of the United Kingdom, Plymouth (England). Lab.
R. P. Harris.
Journal of the Marine Biological Association of the United Kingdom, Vol 52, No 2, p 375-387, May 1972. 5 fig, 2 tab, 26 ref.

Descriptors: *Ecological distribution, *Copepods, *Spatial distribution, Marine animals, Equipment, Crustaceans, Oxygen requirements, Water temperature, Environmental effects, Larval growth stage, Sampling, Intertidal areas, Marine bacteria, Aquatic populations, Beaches, Microscopy, Separation techniques.
Identifiers: Sample preparation, *Harpacticoids, *Copepodites, *Whitsand Bay, Elutriation technique, Arthropods, Arenosetella germanica, Intermedopsyllus intermedius, Kliopsyllus hosatica, Kliopsyllus constrictus, Remanea arenicola, Evansula pygmaea, Leptastacus laticaudatus, Paraleptastacus spinicauda, Arenocaris bifida, Arenopontia subterranea, Psammotopa vulgaris, Psammotopa phyllosetosa, Rhizothrix bocqueti.

Horizontal and vertical distributions were described for the interstitial harpacticoid copepods on a sandy beach of an intertidal transect at Whitsand Bay, Cornwall and compared to copepods on European beaches. Five core samples (50 cm long) were taken from each station with a perspex coring tube (2.6 cm diameter) and sectioned into ten vertical segments. Copepods, extracted from sand by an elutriation technique with a recovery of 90 percent, were stored in 5 percent neutral formalin and stained with Rose Bengal for microscopic examination. Most of the copepods showed distinct horizontal distribution patterns as evidenced by their restriction to narrow zones on the transect. In summer the copepods were concentrated at the sand surface. Deeper distributions were observed in winter when some species were found down to depths of 50 cm. When comparing the vertical zonation of males and females of a species the males were generally found at greater depths in the sand. In the spring there was evidence that ovigerous females were distributed at shallower depths relative to the total female population. The vertical distribution of the copepodites of a given species was usually somewhat shallower than that of the total population. These patterns were correlated with the copepods development. Distribution patterns probably resulted from temperature variations, oxygen availability, the local bacterial populations, and disturbance due to wave action. (Long-Battelle)
W72-13783

SALINITY TOLERANCES OF SOME COMMON PROSOBRANCHS,
Mount Allison Univ., Sackville (New Brunswick). Dept. of Biology.
D. C. Arnold.
Journal of the Marine Biological Association of the United Kingdom, Vol. 52, No. 2, p 475-486, May 1972. 7 fig, 2 tab, 17 ref.

Descriptors: *Ecological distribution, *Salt tolerance, Environmental effects, Water pollution effects, Salinity, Resistance, Gastropods, Marine animals, Geographical regions, Mollusks, Crustaceans, Distribution patterns, Spatial distribution.
Identifiers: *Prosobranchs, Littorina littorea, Patella vulgata, Gibbula cineraria, Nucella lapillus, Balanus balanoides, Littorina littoralis, Littorina saxatilis, Gibbula umbilicalis, *Bay of Fundy, Barnacles, *Gulf of St. Lawrence, Gaspe Peninsula, Cape Shemogue, Cape Breton, Passamaquoddy Bay, Chignecto Bay.

Ecological distributions which result from salinity tolerances have been investigated experimentally for some common prosobranchs. Gastropods (Patella vulgata, Littorina littorea, L. littoralis, Gibbula cineraria, Nucella lapillus) were collected close to high and low-water neap tides on the Castle Rocks, St. Andrews, Scotland, and at five sites on the shore of the Gulf of St. Lawrence, Atlantic coast of Nova Scotia, and Bay of Fundy. The responses of these species to water of different salinities was investigated by use of local inshore water diluted in 10 percent steps with local river water. Patella was studied on an individual basis, using animals of certain shell lengths. The response to local sea water was considered maximal and other responses were scored in proportion to this on a five-point scale. The mobile species were examined statistically by distributing each sample at random among small all-glass aquaria; sea water of appropriate dilutions was added, and after 1 h the movement of the animals was scored. In earlier experiments two species were maintained for a period of 28 days in water containing as much as 4.5 percent salt and were examined for mortality and daily activity. All experiments were carried out at 20-22 C and at low light intensity (13-25 ft-candles) during daylight hours. Salinity was measured by titration with silver nitrate using fluorescein as the indicator. Data showed that salinity tolerances increased with age and size of individuals while small specimens and Littorina spp. and Nucella showed a broad tolerance to diminished salinity at both tide levels. Littorina spp. was found to have adapted to salinity in particular areas of eastern Canadian waters. Gibbula showed a restricted tolerance to diminished salinity similar to Patella at low tide levels. (Long-Battelle)
W72-13795

SALMONELLA.
Defense Documentation Center, Alexandria, Va.

Available from the National Technical Information Service as AD 737 900. $3.00 in paper copy, $0.95 in microfiche. Report No. DDC-TAS-71-62, February 1972. 274 p, 171 ref.

Descriptors: *Salmonella, *Bibliographies, Biology, Epidemiology, Cultures, Methodology, Documentation, Abstracts, Data collections, Microbiology, Systematics, Pollutants, Pathogenic

bacteria, Coliforms, Toxins, Antibiotics (Pesticides), Enteric bacteria, Diseases, E. coli, Shigella, Viruses, Chromatography, Gas chromatography, Analytical techniques, Separation techniques, Temperature, Oxygen, Environment, Enzymes, Geographical regions, Algae, Microorganisms, Iron, Radiation, Metabolism, Instrumentation, Equipment, Laboratory equipment, Microbiology, Bacteriophage, Aerosols, Genetics, Water pollution, Radioactivity effects.
Identifiers: Detection, Fluorescent antibody techniques, Salmonella typhimurium, Ampicillin, Vibrios, Salmonella typhosa, Typhoid, Coliphage, Immunology, Pasteurella pseudotuberculosis, Penicillin, Drugs, Cortisone, Hormones, Chloramphenicol, Salmonella enterocolitis, Shigella dysenteriae, Shigella flexneri, Biochemical studies, Arthopods, Streptomycin, Salmonella paratyphi, Staphylococcus, Nuclear warfare, Cholera, Pasteurella pestis, Characterization, Biosynthesis.

This bibliography is a collection of unclassified references on Salmonella. The disease, the modes of transmission and the vectors are presented. Indexes for Corporate Author-Monitoring Agency, Subject, Title, and Personal Author are included. (Long-Battelle)
W72-13800

DDT: INHIBITION OF SODIUM CHLORIDE TOLERANCE BY THE BLUE-GREEN ALGA ANACYSTIS NIDULANS,
Wisconsin Univ., Madison. Dept. of Entomology.
J. C. Batterton, G. M. Boush, and F. Matsumura.
Science, Vol 176, p 1141-1143, June 9, 1972. 2 tab, 14 ref.

Descriptors: *DDT, *Sodium chloride, *Inhibition, *Salt tolerance, Water pollution effects, Chlorinated hydrocarbon pesticides, *Cyanophyta, Sodium, Potassium, Cultures, Resistance, Aquatic algae, Growth rates, Bioassay, Laboratory tests, Calcium.
Identifiers: *Anacystis nidulans, *Adenosine triphosphatase, Biochemical tests, Ouabain, Potassium chloride.

The effects of DDT on the sodium chloride tolerance of the blue-green alga, Anacystis nidulans were investigated by growth-rate studies. Algal cultures were grown at 30 degrees C on previously defined media with additions of sodium chloride (1 percent by weight) and/or DDT (800 ppb) and growth rate constants were calculated for each condition. A. nidulans was able to tolerate sodium chloride and DDT alone but not in combination. When NaCl was replaced by KCl, no growth was observed with KCl in combination with DDT. Growth did occur in cultures with lower concentrations of either KCl or DDT. That DDT lowered algal tolerance to salts by the inhibition of adenosine triphosphatase activity and the sodium-pump was substantiated by (1) additions of calcium, a transport inhibitor, to the growth cultures (the calcium reduced the permeability of the cells to NaCl, thus reducing NaCl stress) and (2) enzyme assays. Two types of ATPases were used in a comparison of inhibition by DDT and ouabain. The degree of inhibition by DDT was found to exceed that due to ouabain. Growth experiments carried out with glycerol indicated that the NaCl plus DDT inhibition is probably due to an ionic effect and not to osmotic stress. (Long-Battelle)
W72-13809

OIL POLLUTION: PERSISTENCE AND DEGRADATION OF SPILLED FUEL OIL,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05B.
W72-13810

VARIATION IN THE TOXICITY OF ARSENIC COMPOUNDS TO MICROORGANISMS AND THE SUPPRESSION OF THE INHIBITORY EFFECTS BY PHOSPHATE,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Forest Products.
E. W. B. Da Costa.
Applied Microbiology, Vol 23, No 1, p 46-53, January 1972. 2 fig, 5 tab, 11 ref.

Descriptors: *Toxicity, *Arsenic compounds, *Phosphates, *Inhibitions, *Microorganisms, Bacteria, Fungi, Methodology, Cultures, Bioassay, Environmental effects, Water pollution effects, Algae, Heavy metals, Growth, Pseudomonas, Potassium compounds, Pollutant identification, Chlorophyta, Chlorella.
Identifiers: Acremoniella, Dimethyl sodium arsonate, Arsenates, Sodium cacodylate, Culture media, Poria monticola, Poria cocos, Poria vaillantii, Coniophora olivacea, Lenzites trabea, Scopulariopsis brevicaulis, Cladosporium herbarum, Trametes versicolor, Fomes annosus, Fuscoporia contigua, Trametes lilacino-gilva, Xylobolus frustulatus, Aspergillus niger, Chaetomium globosum, Fusarium solani, Mucor microsporus, Penicillium spinulosum, Streptomyces griseus, Bacillus subtilis, Pseudomonas aeruginosa, Chlorella pyrenoidosa.

Two tests were used to measure the toxicity of arsenic compounds to microorganisms and the suppression of the inhibitory effects by phosphate. The toxicity phial test measured the growth of fungi on agar containing various concentrations of arsenates and phosphates. The second, a seeded plate inhibition zone test, measured the effects of phosphate on the arsenate growth inhibition zones. The toxicity of potassium arsenate, as measured by retardation or inhibition of growth on solid nutrient media, showed wide variation among different fungi but was consistently reduced by the addition of large amounts of potassium phosphate, with both arsenic-sensitive and arsenic-tolerant fungi. Poria monticola was completely inhibited by 0.0025 M arsenate but was progressively less inhibited as the phosphate content of the medium increased and grew slowly at 0.04 M arsenate when 0.16 M KH2P04 was added. Cladosporium herbarum showed 36 percent reduction in growth at 0.08 M arsenate in a low-phosphate medium, but when 0.01 M KH2P04 was added, arsenate concentrations up to 0.64 M (at which the medium contains 4.8 percent As) caused no reduction in growth rate. Addition of phosphate also reduced the toxicity of potassium arsenite but not that of dimethyl sodium arsonate (sodium cacodylate). The counteracting effect of phosphate on arsenate toxicity was found to occur with every one of a wide variety of microorganisms tested. The practical implications of the counter-inhibition phenomenon in laboratory investigations and standard tests of arsenical fungicides, in biochemical research, and in the commercial use of arsenical biocides are set out. (Long-Battelle)
W72-13813

EFFECT OF CYCLAMATES ON THE GROWTH OF PULLULARIA PULLULANS,
Roosevelt Univ., Chicago, Ill. Dept. of Chemistry.
E. Merdinger.
Canadian Journal of Microbiology, Vol 18, No 4, p 531-533, April 1972. 2 fig, 3 ref.

Descriptors: *Water pollution effects, *Growth, Soil fungi, Marine fungi, Aquatic fungi, Water pollution, Pathogenic fungi, Analytical techniques, Cultures, Gas chromatography, Metabolism, Methodology, Pollutant identification.
Identifiers: *Pullularia pullulans, *Substrate utilization, *Cyclamates, Cyclohexamine, Carcinogens, N-cyclohexylsulfamic acid, Sodium cyclamiate, *Cyclamic acid, Culture media, Glucose.

A description is given of the effect of N-cyclohexylsulfamic acid (cyclamic acid) and its sodium salt on the growth of the fungus, Pullularia pullulans, which can be isolated from air, seawater, and soil. Formation of the carcinogen, cyclohexylamine, was also assayed. Cells were cultured in flasks containing a basal medium with or without glucose as the carbon source. Cells grown in the absence of glucose were inoculated into media containing various concentrations of cyclamic acid and sodium cyclamate. The initial pH of all media was 5.4-5.6. Flasks were shaken at 28 degrees C and samples were removed at 24 hr intervals for determination of viable cell counts. Cyclohexylamine production was measured by an unpublished procedure of R.C. Sonders. Spent growth media of 8 days were extracted with methylene chloride and 2 liters of the extract was injected into a chromatograph fitted with a hydrogen ionization detector for product analysis. The data showed that increased concentrations of cyclamic acid and sodium cyclamate progressively depressed the growth of P. pullulans in the presence of various concentrations of glucose. Cyclohexylamine was produced in flasks containing 0.4 percent and 0.5 percent glucose and 0.6-1.0 percent cyclamic acid. (Long-Battelle)
W72-13814

CHANGES IN PLANKTON SPECIES COMPOSITION AND DIVERSITY IN A CONTROLLED NUTRIENT ENRICHMENT STUDY,
Kansas Univ., Lawrence. Dept. of Systematics and Ecology.
W. J. O'Brien.
Transactions of the American Microscopical Society, Vol 91, No 1, p 77-91, January 1972. 2 fig, 3 ref.

Descriptors: *Phytoplankton, *Nutrient requirements, Nutrients, Bioindicators, Water pollution effects, Fertilizers, Nitrogen, Bioassay, Phosphorus, Cyanophyta, Oligotrophy, Chlamydomonas, Deficient elements, Mesotrophy, Eutrophication, Trophic level, Protozoans, Aquatic algae, Environmental effects, Chlorophyta, Primary productivity, Chrysophyta.
Identifiers: Enrichment, Chromulina, Cryptomonas erosa, Erkinia subequiciliata, Uroglenopsis americana, Cryptomonas pulsilla, Microcystis aeruginosa, Chroomonas caudata, Chlamydomonas pertusa, Pandorina morum.

An investigation was made of changes in plankton species composition and diversity as biological indicators by controlling the nutrient content/density of their environment. Controlled experimentation was carried out for two years at eight ponds which were organized into four treatment levels (control, low, medium, high) by adding specified amounts of high quality inorganic fertilizer. The control ponds were oligotrophic, the low and medium ponds mesotrophic, and the high ponds eutrophic. In the first year the phytoplankton density was quite variable in the treated ponds with the high treatment level ponds at times having the lowest phytoplankton density and at other times the highest. By mid-summer of the second year, however, the phytoplankton density increased proportionately with increasing treatment level. In 1969, the primary productivity was measured and its response to treatment level was similar to that of the phytoplankton density. In a laboratory study, water from each treatment level was collected and placed in flasks to which was added dissolved inorganic nitrogen or phosphorus or nitrogen and phosphorus together. The test organism, Pandorina morum, was incubated in these separate media for 2 weeks, after which the yield was measured. The final yield of P. morum increased with increasing treatment level. The addition of nitrogen stimulated final yield at all treatment levels but was proportionately less stimulatory with increasing treatment level. The addition of phosphorus did not stimulate final yield at all. (Byrd-Battelle)
W72-13816

GROWTH OF ENDOMYCOPSIS LIPOLYTICA ON HYDROCARBONS,
Regional Research Lab., Jorhat (India). Biochemistry Div.
For primary bibliographic entry see Field 05A.
W72-13817

EPIDEMIOLOGICAL AND ECOLOGICAL ASPECTS DUE TO THE CONSTRUCTION OF RIVER WEIRS IN THE TROPICAL REGIONS,
Institut Pasteur, Paris (France).
R. Deschiens.
C R Hebd Seances Acad Sci Ser D Sci Nat (Paris). 273 (18): 1620-1622. 1971.
Identifiers: Ecology, Epidemiology, *Human diseases, *Invertebrates, River, Tropical, Vectors, Vegetation, *Weirs.

In the tropical regions, the biological composition of artificial retention lakes created by the erection of weirs is similar to that found in natural systems. Within 2-5 yr, the terrestrial vegetation is replaced by river vegetation. The creation of this particular biotype leads to the development of zoophytic associations containing invertebrate vectors carrying pathogenic agents as well as human and animal parasitic endemics which must be controlled by sanitary measures. The observations were made in Cameroun, Ghana, Ivory Coast and Morocco.--Copyright 1972, Biological Abstracts, Inc.
W72-13819

THE BIODEGRADATION OF ORGANIC SUBSTRATES UNDER ARCTIC AND SUBARCTIC CONDITIONS,
Alaska Univ., College. Inst. of Water Resources.
A. P. Murray, and R. S. Murphy.
Available from the National Technical Information Service as PB-211 999, $3.00 in paper copy, $0.95 in microfiche. Alaska Institute of Water Resources, Fairbanks, Report IWR-20, March, 1972, 56 p, 15 fig, 22 tab, 51 ref. OWRR A-014-ALAS (1).

Descriptors: *Biodegradation, *Organic matter, Cellulose, *Microorganisms, Arctic, Subarctic, *Alaska, *Temperature, Growth rates, Biochemical oxygen demand, *Oxygen requirements, Waste assimilative Capacity, Metabolism.
Identifiers: *Psychrophilic microorganisms, Metabolic reaction rates, Substrate utilization, *Cellulolysis.

Incubation of subarctic soil and water microorganisms in the psychrophilic temperature range hindered neither growth nor efficiency of substrate utilization in batch systems. Nevertheless, no direct relationship was observed between the temperature of incubation and kinetic constants. However, the initial food:microorganism ratio appeared to have more influence on the cell growth rate than did any variation in temperature. Values obtained for the reaction rates coefficients for oxygen consumption in subarctic waters indicated no special oxygen requirement for the decomposition of sewage in these waters at low temperatures. Here again temperature seemed to have less of an effect on the rate of oxygen depletion by indigenous microorganisms than did the amount of nutrient present. Initial availability of nutrients was also seen to be important in the bacterial decomposition of cellulose, Cellulolysis was found to be difficult to initiate in a well-mixed, aqueous environment in which no supplemental carbon and energy source was present. To isolate the effects of low temperatures on the metabolic reaction rates of microorganisms indigenous to cold environments from the effects of other variables, particularly those related to nutrient supply and population dynamics, was difficult. And, in fact, in the natural situation, where these variables remain uncontrolled, temperature need not be rate-determining.
W72-13822

WATER QUALITY PREDICTIONS BASED ON LIMNOLOGICAL PARAMETERS,
Clemson Univ., S.C. Water Resources Research Inst.
A. R. Abernathy, and H. R. Bungay, III.
Available from the National Technical Information Service as PB-212 004, $3.00 in paper copy, $0.95 in microfiche. South Carolina Water Resources Research Institute, Clemson, Report No 32, August 1972, 165 p, 55 fig, 11 tab, 155 ref, append. OWRR A-016-SC (4).

Descriptors: *Primary productivity, Nutrients, Plankton, Mathematical models, Reservoirs, Bottom sediments, *Cycling nutrients, *Eutrophication, *South Carolina, Model studies, *Computer models, *Phytoplankton, Dissolved oxygen, Organic matter, Lake sediments, Water quality.
Identifiers: *Hartwell Reservoir.

A restricted sub-basin of Hartwell Reservoir in South Carolina was studied to collect limnological data useful in developing a computer model for predicting primary production and phytoplankton abundance in the reservoir. Physical characteristics of the basin were determined along with water chemistry, nutient budgets, rates of primary production and nutrient recycle from suspended detritus and bottom sediments. A model for predicting primary production with both location and time as independent variables was developed. Predictions agree well with field data. CSMP was used as simulation language for the model. Field data and information on the model are included.
W72-13825

ENDOSULFAN IN THE RHINE RIVER,
Rijksinstituut voor de Volksgezondheid, Utrecht (Netherlands).
P. A. Greve, and S. L. Wit.
J Water Pollut Control Fed. Vol 43, No 12, p 2338-2348. 1971. Illus. Maps.
Identifiers: *Insecticides, *Water pollution treatment, *Pesticide removal, Bacteria, Degradation, Endosulfan, Fishkill, Rhine River.

Endosulfan proved to be the cause of a massive fish kill in the Rhine River in June 1969. Water samples showed concentrations up to 0.7 ppb. The insecticide was identified by gas chromatography and mass spectrometry. Its fate was studied for the rate of detoxification. Degradation was induced by bacteria under neutral, aerobic conditions. Endosulfan was found to be adsorbed by river silt, and up to 85% was removable by filtration and centrifugation. Other adsorbents found useful were ferric hydroxide gel and activated C.--Copyright 1972, Biological Abstracts, Inc.
W72-13847

LINMOLOGY OF ONEIDA LAKE WITH EMPHASIS ON FACTORS CONTRIBUTING TO ALGAL BLOOMS,
Geological Survey, Albany, N.Y.
P. E. Greeson.
New York State Dept of Environment Conservation, Albany, (Geological Survey Open-gile Report), 1971. 185 p, 51 fig, 32 tab, 145 ref, append.

Descriptors: *Limnology, *Lakes, *Eustrophication, *Hydrology, *New York, Water quality, Nutrients, Algae, Inflow, Discharge (Water), Water balance, Sediments, Chemical properties, Dissolved solids, Hydrologic data, Data collections, Lake morphology, Ecology, Biological properties.
Identifiers: *Oneida Lake (NY).

Oneida Lake, in the State of New York, is a naturally eutrophic lake that has existed for about 10,500 years. It has been in a eutrophic state for at least 350 years, and the geochemically derived dissolved materials entering the lake from the drainage basin are of sufficient quantity (449,700 tons per year) to support annual algal blooms. The lake retains 50,000 tons of dissolved solids each year. These materials become incorporated in the boottom sediments. Water in Oneida Lake represents a hydrologic equilibrium. Water entering the lake is from direct precipitation (149,600 acre-feet per year) and from surface water inflow (1,729,000 acre-feet per year (. Water leaves the lake by outflow through the Oneida River (1,730,400 acre-feet per year) and by evaporation (148,200 acre-feet per year). Sixty-seven percent of all water entering Oneida Lake originates in the northern part of the drainage basin. The four most important factors affecting the ecological processes in the lake are: (1) high fertility of the drainage basin, (2) physical position and shallowness of the lake, (3) mixing as caused by wind, and (4) fertility of the bottom sediments. (Woodard-USGS)
W72-13851

Bundesgesundheitsamt, Berlin (West Germany). Institut fuer Wasser-, Boden-, und Lufthygiene.

Bull. Off. int. Epiz., Vol. 65, No. 5-6, p 663-669, 1966. 1 tab.

Descriptors: *Pesticide toxicity, *Herbicides, *Freshwater fish, *Aquatic animals, *Water pollution effects, *Lethal limit, Pesticides, Agricultural chemicals, Bioassay, 2-4-5-T, 2-4-D, Aminotriazole, Triazine pesticides, Dalapon, Carp, Trout, Pikes, Toads, Crayfish, Daphnia, Tubificids, Larvae.
Identifiers: MCPB, MCPA, DNOC, Monolinuron, Diuron, Simazin, Atrazin, Amitrol, Guppies, Tadpoles, Water fleas, Gammarids, Carlinogammarus spp., Water lice, Asellus spp., Tubifex spp., Gnats, Chirononus spp., Corethia spp., Aedes spp., Egyptian fever gnat.

Fifteen herbicides of a different chemical compound were tested for their toxicity in fish and fish feeding animals of fresh water. Only preparations which were on sale and for which evidence of application in the proximity of waterswas obvious were tested. A comparison of the values in fish and fish feeding animals shows that the fish feeding animals become injured with a much greater range of concentrations than do the fish. The limit of concentration at which the first fish feeding animals are dying will remain lower than that for fish in most cases, while the lethal limit of concentration is mostly to be found much above the limited values for fish. (Svensson - Washington)
W72-13864

PESTICIDE AND MERCURY LEVELS IN MIGRATING DUCK POPULATIONS,
Iowa Univ., Iowa City.
L. G. Johnson, R. L. Morris, and R. Bishop.
Bulletin of Environmental Contamination and Toxicology, Vol. 6, No. 6, p 513-516, 1971. 2 tab, 3 ref.

Descriptors: *Pesticide residues, *Ducks (Wild), *Mercury, *Chlorinated hydrocarbon pesticides, *Public health, Path of pollutants, Water pollution effects, Pesticides, Migratory birds, Mallard ducks, Lesser scaup duck, Shoveler duck, Pintail duck, Green-winged teal, Dieldrin, DDT, Heptachlor, Insecticides, American widgeon.

Because of the extensive hunting and human consumption of migratory ducks in Iowa, the mercury and pesticide levels in various tissues of these birds were measured. Mallard ducks were collected from seven locations and composite samples made of the breast muscle, liver and fat of the ducks taken at each individual location. Five other species were collected from various areas and the breast muscle, liver and fat from all the birds of a given species were prepared as composite samples. The pesticide data show that the pesticide concentrations are lowest in the breast muscle and highest in the fat for any of the sets of composites. The mercury in the tissues has a distribution distinctly different from the chlorinated hydrocar-

bons, being lowest in the fat and highest in the liver. Only two samples were significantly above the FDA established 0.5 mg/kg mercury concentration. The liver samples of the Lesser Scaup and the Shoveller ducts were 1.3 and 1.2 mg/kg, respectively. Except for the two values of mercury in the liver, the samples did not show evidence of significant contamination by pesticides abd mercury when evaluated against FDA tolerances for fish. (Svensson-Washington)
W72-13865

THE RIVER WEAR: INORGANIC CHEMISTRY RELEVANT TO A BIOLOGIST,
Durham Univ. (England).
For primary bibliographic entry see Field 02K.
W72-13866

ACTIVITY RESPONSE TO CHLORINE IN THE BROOK TROUT, SALVELINUS FONTINALIS (MITCHELL),
Manitoba Univ., Winnipeg.
J. W. T. Dandy.
Canadian Journal of Zoology, Vol. 50, No. 4, p 405-410, 1972. 1 fig, 3 tab, 10 ref.

Descriptors: *Chlorine, *Brook trout, *Toxicity, *Bioassay, *Fish physiology, Water pollution effects, Fish behavior, Lethal limit, Ventilation.
Identifiers: *Sublethal effects, Salvelinus spp.

Exposure of brook trout to chlorine evoked changes in activity, ventilation, the coughing reflex, and at lethal levels a heavy secretion of mucus. Locomotory activity increased initially and was subsequently depressed. Both responses were seen at 0.35 and 0.08 mg/l, but the initial increase was not seen at 0.04 or 0.005 mg/l. The initial increase lasted 2 hr, while the depressant response was still continuing after 7 days at the sublethal level of 0.005 mg/l. The results are discussed in relation to the different selection responses to different chlorine concentrations shown in rainbow trout by others. (Svensson-Washington)
W72-13867

GROWTH OF THE FATHEAD MINNOW (PIMEPHALES PROMELAS) IN TERTIARY TREATMENT PONDS,
Iowa State Univ., Ames.
J. L. Konefes, and R. W. Bachmann.
Proceedings of the Iowa Academy of Science, Vol. 77, p 104-111, 1970. 4 fig, 6 ref.

Descriptors: *Fish farming, *Aquiculture, *Sewage effluents, Fish hatcheries, Fish management, Fisheries, Fish reproduction, Growth rates, Animal growth, Fish behavior, Water reuse, Tertiary treatment, Ponds.
Identifiers: *Fathead minnows, *Fish growth, Pimephales spp.

A series of experimental ponds, utilizing treated sewage effluent as a water source, have been constructed at the Ames Water Pollution Control Plant. Fathead minnow fry were introduced into the ponds in the summer of 1969 and observations were made on their growth rates, reproduction, and food habits during the summer months. Growth was comparable to that previously reported for hatchery ponds. The fish matured by mid-summer and successfully reproduced a second crop of fry. The use of tertiary ponds for fish production seems to be a useful approach to the conservation of natural resources. (Svensson-Washington)
W72-13868

CONCENTRATION OF MERCURY IN THE MANUFACTURE OF FISH PROTEIN CONCENTRATE BY ISOPROPYL ALCOHOL EXTRACTION OF SHEEPSHEAD AND CARP,
Canisius Coll., Buffalo, N.Y.
T. A. Gasiewicz, and F. J. Dinan.
Environmental Science and Technology, Vol. 6, No. 8, p 726-727, August 1972. 2 tab, 10 ref.

Descriptors: *Mercury, *Water pollution effects, *Public health, *Foods, Heavy metals, Freshwater fish, Carp, Great Lakes, Lake Erie, Separation techniques.
Identifiers: *Fish protein concentrate, Niagara River, Sheepshead, Isopropyl alcohol extraction.

Levels of mercury in bottom feeding freshwater fish and their corresponding fish protein concentrates have been determined and found to correlate with a fish:fish protein concentrate enrichment factor of approximately 5. This finding indicates that no mercury is extracted from the fish used in this study during the concentrate manufacture via isopropyl alcohol extraction, and further suggests that only fish of low initial mercury concentration may be used as starting material in this process if the resultant fish protein concentrate is not to exceed the maximum allowable mercury concentration level. (Svensson-Washington)
W72-13869

SALINITY TOLERANCE OF YOUNG BLUEBACK HERRING, ALOSA AESTIVALIS,
Virginia Inst. of Marine Science, Gloucester Point.
M. E. Chittenden, Jr.
Transactions of the American Fisheries Society, Vol 101, No 1, p 123-125, January 1972. 6 ref.

Descriptors: *Herrings, *Salt tolerance, Anadromous fish, Fish physiology, Saline water, Bioassay, Saline water-freshwater interfaces, Lethal limit.
Identifiers: Alosa spp., Blueback herring.

The salinity tolerance of young blueback herring is of particular interest in view of the tendency of this fish to spawn in and near tidal water. All specimens exposed to gradual salinity increase and nine fish directly transferred to high salinity water suffered no mortality, fed avidly after the second day, and appeared to thrive throughout the experiments. The tenth fish transferred directly to high salinity water appeared in satisfactory condition shortly after transferral but died nine hours later. The death may have been due to handling stress rather than to the salinity change. These experiments indicate that the blueback herring is highly salinity tolerant early in life. Euryhaline tolerance allows this species to occupy both saltwater and freshwater nurseries. (Svensson-Washington)
W72-13870

DYNAMICS OF PHYTOPLANKTON PRIMARY PRODUCTION AND BIOMASS IN LOVIISA ARCHIPELAGO (GULF OF FINLAND),
Institute of Marine Research, Helsinki (Finland).
P. Bagge, and A. Niemi.
Merentutkimuslait. Julk./Havsforskningsinst. Skr., No 233, p 19-41, 1971. 7 fig, 2 tab, 35 ref, 1 app.

Descriptors: *Phytoplankton, *Primary productivity, *Eutrophication, *Biomass, *Hydrography, Algae, Aquatic algae, Oligotrophy, Dissolved oxygen, Water temperature, Hydrogen ion concentration, Stratification.
Identifiers: Orthophosphate concentrations, Gulf of Finland.

Phytoplankton primary production and biomass at two sampling localities situated in the Loviisa archipelago were studied during 1967-1969. Primary production was measured mainly by the in situ carbon-14 technique and quantitative analyses of phytoplankton were usually made once a month during the growing season. No linear correlation was observed between production and biomass values. The data of primary production and phytoplankton obtained in the Loviisa area are compared with those available from other areas situated on the northern coast of the Gulf of Finland. The magnitude of production (ca. 30-40 g C (ass.)/square meter/year) and the succession and biomass of phytoplankton in the Loviisa area were found to be typical of the oligotrophic waters of the south coast of Finland, however the occurrence of some algal species points to a weak eutrophication of the waters studied. (Svensson-Washington)
W72-13871

SOME HAEMATOLOGICAL AND METABOLIC CHANGES IN FISH OCCURRING AFTER PESTICIDE INTOXICATION (NEKTERE HEMATOLOGICKE A METABOLICKE ZMENY U RYB PO INTOXIKACI PESTICIDY),
Vyzkumny Ustav Rybarsky a Hydrobiologicky Vodnany, Prague (Czechoslovakia).
Z. Svobodova.
Bulletin VUR Vodnany, Vol 7, No 3, p 29-36, 1971. 3 tab, 32 ref. English summary.

Descriptors: *Pesticide toxicity, *Fish physiology, *Carp, Water pollution effects, Metabolism, Biochemistry.
Identifiers: *Hematological changes, Metation E 50, Nitrosan 50, Trifenox TM, Neren, Hemoglobin, Hematocrit, Erythrocytes, Glycogen, Glucose, Blood.

The changes in some hematological and metabolic indices were examined in the carp after pesticide intoxication. The cases were peracute Metation E 50, Nitrosan 50, Trifenox TM 1:1, and Neren intoxication, and chronic intoxication with Metation E 50. The hematological indices under study were the following: erythrocyte number, content of hemoglobin, mean color concentration color index; the examination of the glycide metabolism included glycogen content in the hepatopancreas and glucose level in biood. The nature of the hematological changes in fish after pesticide intoxication (with the exception of Nitrosan 50) was almost the same in all cases. The main response of the fish to the pesticide preparations was a large increase in the mean erythrocyte volume, increase of hematocrit, and a significant reduction of mean color concentration. The response of the fish to the effect of Nitrosan 50 was the release of erythrocytes from the blood deposits. Pesticide intoxication caused a decrease in the level of glycogen in the hepato-pancreas and a significant increase in the level of glucose in the blood. These effects cannot be considered specific for the effect of pesticides, but pesticide intoxication should be considered a cause evoking these changes. (Svensson-Washington)
W72-13873

OBSERVATIONS ON THE OXYGEN NEEDS OF SOME SPECIES OF EUROPEAN PLECOPTERA,
Limnologische Fluss Station, Schlitz (West Germany).
L. Benedetto.
Internationale Revue ges. Hydrobiologie, Vol 55, No 4, p 505-510, 1970. 5 fig, 1 tab, 19 ref.

Descriptors: *Stoneflies, *Oxygen requirements, Oxygen, Dissolved oxygen, Respiration, Animal physiology, Bioassay, Distribution.
Identifiers: Dinocras spp., Perlodes spp., Diura spp., Nemoura spp.

In order to evaluate the comparative sensitivity of a large gilled species of Plecoptera and some species without gills to lowered dissolved oxygen, four types of stonefly nymphs, one with gills and three without, were exposed to four different concentrations of dissolved oxygen. The gilled species showed a definitely superior ability to withstand reduced oxygen concentration, in agreement with work done previously by others. Distributions of the four species are considered in light of their oxygen requirements. (Svensson-Washington)
W72-13874

MORTALITY OF PACIFIC OYSTERS (CRASSOTREA GI-GAS): THE INFLUENCE OF TEMPERATURE AND ENRICHED SEAWATER ON OYSTER SURVIVAL,
Washington Univ., Seattle.
V. P. Lipovsky, and K. K. Chew.
In: Proceedings of the National Shellfisheries Association, Vol 62, p 72-82, June 1972. 13 fig, 41 ref. NSF GH-40.

Descriptors: *Oysters, *Mortality, *Bioassay, *Pathogenic bacteria, *Heated water, Commercial shellfish, Water temperature, Bacteria, Aquatic bacteria, Spawning, Aquatic environment, Animal physiology.
Identifiers: *Nutrient enrichment, *Invertebrate pathology, Crassostrea spp., Vibrio spp., Mesophilic bacteria, Gram negative bacteria.

Pacific oysters brought into the laboratory for conditioning studies experienced a high mortality of an unknown origin. Death was related to high temperature and enriched seawater from cultured algal food. Oysters in seawater at 9C had no mortalities; 14C--2% mortality; and 21C--100% mortality. Oysters periodically transferred between 9 and 21C showed reduced mortalities. Death were four to five times greater in nutrient-enriched seawater. Spawned oysters in non-enriched seawater had an increased mortality. Presumably, death results from a bacterial proliferation. Gram negative bacteria identified as mesophilic Vibrio spp. were monitored at 9 and 21C in the oysters and seawater. Histologically, cellular responses, tissue pathology and bacteria in the tissues increased progressively with a rise in temperature. There may be a connection between the laboratory deaths and some of the summer Pacific oyster mortalities in Washington State. (Svensson-Washington)
W72-13875

MARIN ENVIRONMENTAL QUALITY, SUGGESTED RESEARCH PROGRAMS FOR UNDERSTANDING MAN'S EFFECT ON THE OCEANS.
National Academy of Sciences-National Research Council, Washington, D.C. Committee on Ocean Sciences.
For primary bibliographic entry see Field 05A.
W72-13903

THERMAL EFFLUENTS FROM ELECTRICAL POWER GENERATION,
Fisheries Research Board of Canada, West Vancouver British Columbia). Pacific Environment Inst.
W. H. Bell.
Technical Report No 262, April 1971. 59 p, 2 tab, 94 ref.

Descriptors: *Electric power demand, Thermal pollution, *Thermal powerplants, Steam, Water quality, Water pollution effects, *Biological communities, *Temperature, Forecasting, Oceanography, Coasts, Canada.
Identifiers: *British Columbia.

Steam electric plants are expected to be used more and more frequently to meet future demands for electrical power generation. When the heated water from these plants is discharged into natural bodies of water, changes in water quality, both adverse and beneficial, are bound to occur. Effects on biological species from thermal discharges are being studied along with attempts to predict the resulting temperature distributions. These studies should be considered prior to the establishment of future steam-electric plants. Part two of this study deals specifically with the effects of thermal effluents in the coastal waters of British Columbia. The various oceanographic conditions of a vertically mixed area, a partially enclosed embayment and a stratified estuary are studied and compared in their responses to thermal effluents. (Ensign-PAI)
W72-13905

DDT RESIDUES IN EIGHT CALIFORNIA MARINE FISHES,
Philadelphia Community Coll., Pa.
For primary bibliographic entry see Field 05B.
W72-13946

PROPOSED HYBRID PROTOTYPE DESALTING PLANT FOR BROWNSVILLE, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Office of Saline Water, Washington, D.C.
For primary bibliographic entry see Field 03A.
W72-13958

MUSSELS AND BARNACLES AS INDICATORS OF THE VARIATION OF MANGANESE-54, COBALT-60 AND ZINC-65 IN THE MARINE ENVIRONMENT,
Southern California Coastal Water Research Project, Los Angeles.
For primary bibliographic entry see Field 05B.
W72-13978

CONCENTRATIONS OF ZINC-65 IN MARINE FOODSTUFFS AND PACIFIC COASTAL RESIDENTS,
Battelle-Pacific Northwest Labs. Richland, Wash.
For primary bibliographic entry see Field 05B.
W72-13979

ENVIRONMENTAL RADIOACTIVITY AT THE NATIONAL NUCLEAR RESEARCH CENTRE, PELENDABA. REPORT FOR THE YEAR 1970.
Atomic Energy Board, Pretoria (South Africa).
For primary bibliographic entry see Field 05B.
W72-13984

EFFECTS OF TEMPERATURE ON THE RESPIRATORY METABOLISM OF THREE CHESAPEAKE BAY BIVALVES,
Maryland Univ., Solomons. Natural Resources Inst.
V. S. Kennedy, and J. A. Mihursky.
Chesapeake Science, Vol 13, No 1, p 1-22, March 1972. 23 fig, 13 tab, 61 ref. A-002MD (13) and A-011MD (4).

Descriptors: *Respiration, *Animal physiology, *Water temperature, *Metabolism, *Thermal pollution, *Clams, Temperature, Compensation, Water pollution, Heated water, Chesapeake Bay, Water pollution effects.
Identifiers: *Respiratory rates, Macoma spp., Mulinia spp., Mya spp., Bivalves.

Respiratory rates of Macoma balthica, Mulinia lateralis and Mya arenaria were determined under an experimental design using acclimation and exposure temperatures ranging from 1 to 30 C. Rates decreased with increasing size and in general varied directly with temperature. However, high temperatures (30C) depressed metabolism of cold-acclimated Mulinia and Mya. Very young Mya were less affected by high temperature (30C) than were Mya a few months older. Macoma was least affected by high or low temperature stress, followed by Mya, then Mulinia. All three species were able to compensate for temperature change to a varying extent. Unseasonal artificial warming of the benthic environment could elevate metabolism of the species studied, which could lead to starvation if food were scarce, especially in winter.
W72-13997

LIFE HISTORY OF THE EASTERN JOHNNY DARTER, ETHEOSTOMA OLMSTEDI STORER, IN COLD TAILWATER AND SEWAGE-POLLUTED WATER,
Maryland Univ., Solomons. Natural Resources Inst.
C. F. Tsai.
Transactions of the American Fisheries Society, Vol 101, No 1, p 80-88, January 1972. 5 fig, 3 tab, 21 ref. OWRR B-006-Md (4).

Descriptors: *Darters, *Fish populations, *Tailwater, *Sewage, *Water pollution effects, Freshwater fish, Fish eggs, Water temperature, Water pollution, Spawning, Fish reproduction, Animal growth, Fecundity, Streams, Rivers, Maryland.
Identifiers: *Eastern Johnny darter, Etheostoma spp., Condition factor, Patuxent River Maryland.

The life histories of two populations of E. olmstedi in the Patuxent River, Maryland, one in cold reservoir tailwater and the other in sewage-polluted water, were studied to determine the effects on this species of man-made modifications in the stream. The spawning season was in May and June with temperatures approximately 12.5-14.5 C in the cold tailwater and 16.0-18.5 C in the sewage polluted water. In the sewage polluted water, the fish grew faster in early summer of the first year than those in cold tailwater, but later growth decreased, even though the condition factor, or degree of well-being, continued to increase. Fecundity of the sewage-polluted water population was greater than that in the cold tailwater population because of larger body weight. In the sewage-polluted water, there were fewer males with a lower condition factor than females. It also had a higher percentage of fish in the II-year class and a lower percentage in the I-year class than the cold tailwater population. Males did not grow as rapidly as females in the cold tailwater. (Svensson-Washington)
W72-13998

CHLORINATED HYDROCARBON, MICROPARTICULATE EFFECTS ON MICROORGANISMS ISOLATED FROM LAKE ERIE,
Ohio State Univ., Columbus.
R. M. Pfister, J. I. Frea, P. R. Dugan, C.I. Randles, and K. Zaebst.
In: Proceedings of the 13th Conference on Great Lakes Research, International Association of Great Lakes Research, p 82-92, 1970. 10 fig, 3 tab, 13 ref. OWRR B-013-OHIO (5).

Descriptors: *Chlorinated hydrocarbon pesticides, *Water pollution effects, *Growth rates, *Bacteria, *Endrin, *Aldrin, *Heptachlor, *Dieldrin, Pesticides, Insecticides, Water pollution, Particle size, Lake Erie, Aquatic bacteria, Aerobic bacteria, Bioassay, Colloids.
Identifiers: *Lindane, Sublethal effects, Size analysis.

Water samples from the western basin of Lake Erie have been analyzed with regard to the distribution of colloidal microparticles. Size analyses of particulate samples revealed that the most common size particle was in the range of 0.1 micrometer. Chlorinated hydrocarbon pesticides such as endrin, aldrin, heptachlor and lindane were found in association with these particles and the data suggest that aldrin and heptachlor were found more frequently on the smaller, less dense particles, while lindane was associated with the larger, more dense fractions. Bacteria isolated from these water samples prior to chemical analyses were grown in the presence of clay microparticles freed of pesticides, microparticles containing known amounts of pesticides, and purified pesticides alone. Bacterial growth effects were measured, and results demonstrate that different bacteria in the presence of endrin, aldrin or dieldrin could be affected in different ways, i.e. stimulated or inhibited. (Svensson-Washington)
W72-13999

DESIGN AND SITING CRITERIA FOR ONCE-THROUGH COOLING SYSTEMS BASED ON A FIRST-ORDER THERMAL PLUME MODEL,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.

D. W. Pritchard, and H. H. Carter.
Chesapeake Bay Institute Technical Report No 75 (Reference 72-6), Johns Hopkins University, April 1972. 51 p, 1 fig, 5 tab, 16 ref.

Descriptors: *Thermal pollution, *Nuclear powerplants, *Water pollution effects, *Ecology, *Environmental effects, Aquatic life, Engineering structure, Design criteria, Data collections, Water temperature, Water cooling, Sites, Planning.

The distributions of excess temperature, and the time-temperature history of exposure of organisms entrained into the thermal plume resulting from the discharge of condenser cooling water from a nuclear powerplant, are given for several alternate sets of design criteria for the discharge structure. In order to minimize adverse effects on natural water bodies used to supply condenser cooling water flow for once-through cooling systems, the powerplant should be located on a waterway having large dilution capacity. The discharge structure should be designed to promote rapid dilution of the heated effluent by the cooler receiving waters. Intake structures should be designed to provide for low intake velocities, and to provide an effective means of diverting fish and other aquatic organisms away from the intake. Time of travel of the condenser cooling water flow from the condensers to the point of discharge should be kept small, in order to minimize the time of exposure of entrained organisms to the maximum temperature rise. (Woodard-USGS)
W72-14030

THE EFFECTS OF INCREASING SALINITY ON THE PYRAMID LAKE FISHERY,
Nevada Univ., Reno. Max C. Fleischmann Coll. of Agriculture.
R. E. L. Taylor.
Available from the National Technical Information Service as PB-212 045, $3.00 in paper copy, $0.95 in microfiche. Agricultural Experiment Station Bulletin 15, R 88, February 1972. 7 p, 1 fig, 4 tab. OWRR A-040-NEV (1) and A-042-NEV (1).

Descriptors: *Salinity, *Fishery, Sodium salts, Chloride, Carbonate, Bicarbonate, *Water level, *Trout, Water pollution effects, *Nevada.
Identifiers: *Pyramid Lake, *Lahontan cutthroat trout, Truckee River, Lake Tahoe, Winnemucca Lake.

Groups of Lahontan Cutthroat Trout were tested in Pyramid Lake Water which was altered with the addition of the sodium salts of sulfate, chloride, carbonate and bicarbonate, to simulate conditions in the lake as the lake volume decreases. Trout tested at 50 degrees F for 14 days would tolerate an environment representing up to 2 1/2 times the present salt concentration but would not tolerate 3 times the present salt concentration. The former environment (2.5X concentration level) represents what will occur when the lake reaches 3660 feet above sea level. Therefore, Pyramid Lake should be maintained as much above this elevation as possible to protect the fishery. (Clasen-Nevada)
W72-14054

COMPARATIVE EFFECTS OF AQUATIC BIOTOXINS ON CARDIAC SYSTEMS,
New Hampshire Univ., Durham. Dept. of Zoology.
F. P. Thurberg.
PhD Thesis, January 1972. 74 p, 9 fig, 3 tab, 100 ref. OWRR A-013-NH (6) and A-021-NH (3).

Descriptors: *Algal toxins, *Poisonous plants, *Cyanophyta, *Nuisance algae, *Aquatic algae, *Crustaceans, *Fish toxins, *Algal poisoning, Dinoflagellates, Beggiatoa, Phytoplankton blooms, Physiological ecology, Mortality, Red tide, Toxicity.
Identifiers: Aquatic biotoxins, *Biotoxins.

Toxins from 3 marine dinoflagellates, Gymnodium breve, Amphidinium carteri and Gonyaulax catenalla, and a freshwater blue-green alga, Aphanizomenon flos-aquae were obtained by laboratory culture, field collection and correspondence with other investigators. In vivo and isolated hearts of decapod crustaceans, Cancer irroratus and Carcinus maenus, the bivalve molluscs, Mya arenaria and Mercenaria mercenaria and the grass frog Rana pipiens were exposed to these toxins, and mechanical and electrical activity were measured. Gymnodinium breve toxin excited crustacean hearts, depressed frog hearts and had no effect on molluscan hearts. These observations and experiments with human blood cholinesterase and mammalian intestine suggest anticholinesterase-like activity as one action of G. breve toxin. Amphidinium carteri toxin excited crustacean hearts and depressed molluscan and frog hearts. This choline-like action was further demonstrated with mammalian intestine preparations and the use of the choline blocking compound, mytolon chloride. Aphanizomenon flos-aquae and Gonyaulax catenella toxins depressed frog and crustacean hearts but had no effect on molluscan hearts. This evidence supports reported physiological and chemical similarities of these two toxins.
W72-14056

A RE-EVALUATION OF THE ANAEROBIC ENDPRODUCTS OF FRESHWATER FISH EXPOSED TO ENVIRONMENTAL HYPOXIA,
Academy of Natural Sciences of Philadelphia, Pa.
D. T. Burton, and A. M. Spehar.
Comp Biochem Physiol A Comp Physiol, 40 (4): 945-954, Illus, 1971.
Identifiers: *Anaerobic conditions, Environmental effects, Fatty-Acids, Fish, *Hypoxia, Lactic-Acid, Pyruvic-Acid, Water pollution effects.

Lactic acid and free short-chain fatty acids were reported in the literature as anaerobic endproducts produced by fish when exposed to environmental hypoxia. A significant increase in lactic acid was found in skeletal muscle and liver of Salmo trutta exposed to sudden hypoxia and of S. gairdneri, Lepomis macrochirus and Ictalurus nebulosus exposed to gradual hypoxia. No free short-chain fatty acids were found in skeletal muscle or liver of control or experimental fish after being exposed to hypoxia. A significant reduction in pyruvic acid was found in skeletal muscle only of S. gairdneri and L. macrochirus after being exposed to gradual hypoxia. No changes in the types of anaerobic endproducts occurred as a result of thermal acclimation to warm and cold temperatures.--Copyright 1972, Biological Abstracts, Inc.
W72-14093

TENTATIVE EVALUATION OF INDUSTRIAL DAMAGE IN STANDS OF THE GOLONOG FOREST DISTRICT,
Feliks Nowak.
Sylwan, 114 (2): 41-45, Illus, 1970.
Identifiers: *Air pollution, Contamination, Damage, Forest, *Golonog forest, *Industrial pollution, Poland, Soils, Water pollution effects.

Air pollution and water and soil contamination reduced wood output of this Polish woodland by 50%. The use of quick-growing plants and fertilizers is recommended.--Copyright 1972, Biological Abstracts, Inc.
W72-14095

CONTAMINATION OF LETTUCE IRRIGATED WITH SEWAGE EFFLUENT,
Advisory Service, Exeter (England). Agricultural Development.
For primary bibliographic entry see Field 05B.
W72-14104

WATER PLANT COMMUNITIES IN EASTERN LOWER SAXONY (I AND II), (IN GERMAN),
D. W. Weber-Oldecop.
Int Rev Gesamten Hydrobiol. 55 (6): 913-967. 1970. and 56 (1): 79-122. 1971. English summary.
Identifiers: Communities, *Germany, *Lemna-M, Plant, Water pollution, *Potamogeton-M, Season, Temperature, *Aller River (Saxony).

In the drainage area of the Aller river, a tributary of the Weser stream (eastern Lower Saxony, W. Germany), 12 aquatic communities in rivers, brooks and ox-bow lakes were investigated. The plant communities are described and classified on the basis of the principles of Braun-Blanquet. Ecological factors of paramount importance to the aquatic vegetation were taken into account, such as chemical composition of the water, velocity of current, water pollution, soils, temperature of water in the seasons, fluctuations in the water level, and climate. The correlation between environment and distribution of the associations is discussed. The 12 vegetation units belong to the phytosociological classes Lemnetea and Potamotea.--Copyright 1972, Biological Abstracts, Inc.
W72-14117

PERPETUATION OF BACTERIAL BLIGHT DISEASE OF PADDY AND PRESERVATION OF ITS INCITANT: I. SURVIVAL OF XANTHOMONAS ORYZAE IN WATER,
Uttar Pradesh Agricultural Univ., Naini Tal (India). Dept. of Plant Pathology.
R. N. Singh.
Identifiers: *Bacterial blight, Culture, Disease, *Paddy-M, Preservation, *Xanthomonas-Oryzae.

X. oryzae (Uyeda and Ishiyama) Dowson cultures can survive in sterile tap and distilled water for a period of over 12 mo. clearly indicating that these can be used as inexpensive, reliable and practical medium for preservation of the pathogen without any loss of viability and virulence. Due to the survival of the pathogen for short periods only, 15 and 38 days in field and pond water, respectively, they were not found to play any role in the perpetuation of the disease.--Copyright 1972, Biological Abstracts, Inc.
W72-14118

PATTERNS OF LAKESHORE USAGE AROUND LAKE BEMIDJI,
Bemidji State Coll., Minn.
C. S. Holt, R. A. Schulz, and C. M. Hadland.
J Minn Acad Sci. 37 (2/3): 104-108. Illus. Map. 1971.
Identifiers: Algae, *Lake Bemidji (Minn), *Eutrophication, Lakes, *Lakeshore development, Minnesota, Plants, Soils.

The eutrophication of lakes has been the subject of much discussion in scientific journals and the popular press. Usually the eutrophication process is accelerated by human activities. This study evaluates the extent of lake shore development and recreational use of Lake Bemidji in north central Minnesota and examines the willingness of lakeshore residents to be assessed for corrective measures to halt deterioration of this valuable recreational lake. The shoreline of Lake Bemidji is highly developed, and the high density human habitation represents a potential source of nutrients from percolation through the sand and gravel soils which surround the lake. Residents around Lake Bemidji believe that growth of algae and aquatic vascular plants is not now severe and that it does not affect their use of the lake for recreational purposes. Although 75% of the residents favor regulation of lakeshore use and development, only 37% indicate willingness to be assessed for construction of a sewer line surrounding the lake.--Copyright 1972, Biological Abstracts, Inc.
W72-14131

POLLUTANT CONCENTRATIONS IN ABNORMAL YOUNG TERNS FROM LONG ISLAND SOUND,
American Museum of natural History, New York.
H. Hays, and R. W. Risebrough.
Auk. 89 (1): Illus. 1972.
Identifiers: BI, DDT, Fish, New York, *Pollutant concentration, *Terns, *Great Gull Island (NY), *Polychlorinated biphenyls.

The incidence of abnormal chicks of common and roseate terns in the colony on Great Gull Island, New York, at the eastern end of Long Island Sound, was recorded during a productivity study in 1969 and 1970. Over 2000 young common terns and more than 800 young roseate terns were handled each year. In 1969, 0.1% of the young terns showed an abnormality and in 1970, the incidence of visible defects was 1.3%. Abnormalities included feather loss in juvenile terns, as well as eye, bill, and foot deformities in several newly hatched young terns. Abnormal young collected in 1970 and fish brought to the colony by adults were analyzed for the DDT and PCB compounds and in some cases for total Hg. Concentrations of Hg in the livers of the young terns ranged from 0.2 to 1.2 ppm on a fresh weight basis with arithmetic and geometric means of 0.76 and 0.68 ppm, respectively. Median concentrations of DDE and PCB in the breast muscle of the young terns were 2.1 and 25 ppm wet weight, respectively. Median concentrations of the sum total of the three principal DDT compounds p,p -DDE, p,p -DDD, and p,p -DDT and of PCB in collections of 8 spp. of fish brought to the colony by adult terns were 0.19 and 1.0 ppm wet weight, respectively. On a lipid basis, DDT residues ranged from 4.2 to 13.9 ppm and PCB ranged from 10 to 180 ppm in 6 of the fish species. Long Island Sound is much less contaminated with DDT compounds than are the coastal waters of California. The abnormalities recorded resemble those produced in young chickens under experimental conditions by the chlorinated dibenzo-p-dioxins and some preparations of the polychlorinated biphenyls.--Copyright 1972, Biological Abstracts, Inc.
W72-14134

EFFECT OF PUMPING FRESHWATERS INTO OIL STRATA OF THE PERM PRIKAMJE ON THE DISTRIBUTION OF MICROFLORA, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Mikrobiologii.
E. P. Rozanova, A. L. Baldina, V. N. Bykov, and T. A. Kosogorova.
Mikrobiologiya. 40 (4): 718-723. Illus. 1971. English summary.
Identifiers: *Heterotrophic bacteria, Flora, Micro organisms, *Oil strata, Perm Prikamje, *Pumping, Salinity, USSR.

Studies on microflora of the oil-bearing terrigenic stratum of coal-beds did not reveal the presence of sulfate-bearing, oil-oxidizing and heterotrophic bacteria. These groups of microorganisms were abundant in freshwaters enriched with sulfates and 02 and used for pumping into oil strata. The initial stage in the formation of biocenosis of the oil-oxidizing and sulfate-reducing bacteria was detected in the near-face zone of the stratum where freshwaters were pumped. These bacterial groups were detected only in the samples of diluted waters from the wells. Salinity of these waters did not exceed 14-32 g/l. The content of viable bacteria was low and fell to zero with an increase of salinity. Hydrogen sulfide was absent. These data can be explained by an insufficient duration of watering and the rate of transport of freshwaters in the stratum from the pumping region.--Copyright 1972, Biological Abstracts, Inc.
W72-14135

EFFECTS OF CULTURAL PRACTICES AND FERTILIZERS ON SUGAR BEET QUALITY,
Broom's Barn Experiment Station, Bury St. Edmonds (England).
A. P. Draycott, M. J. Durrant, and P. J. Last.
I I R B Rev Inst Int Rech Betteravieres. 5 (3): 169-185. Illus. 1971. French and German summary
Identifiers: *Beet-D, *Fertilizers, Harvest, Irrigation, Nitrogen, Rainfall, Sugar beets.

Effects of plant population, length of growing period (by varying the time of sowing and harvesting), irrigation, rainfall before harvest and fertilizers on sugar beet quality are summarized from 350 field experiments. Sugar percentage and juice purity increased significantly with increasing plant population every year. Effects of length of growing period were less consistent but increasing it always increased juice purity in the range tested (March-Dec.). On average, lengthening the growing period at 1st increased and then decreased sugar percentage but the effect was largely governed by rainfall before harvest. Irrigation decreased sugar percentage but increased juice purity. Of the fertilizers tested, only N changed the quality greatly, 225 kg/ha decreasing sugar percentage by 1.0% and juice purity by 1.5%. Applications of phosphate had little effect on sugar percentage and the cations K, Na and Mg increased it slightly. Neither phosphate nor the cations had much effect on juice purity. The quality changes established were used to investigate optimum plant population, length of growing period and N application both for total sugar and extractable white sugar and the corresponding changes in the value of the crop. The optima were remarkably similar, suggesting that practices which gave maximum total sugar also gave near-maximum extractable white sugar.--Copyright 1972, Biological Abstracts, Inc.
W72-14139

RESPIRATORY AND CIRCULATORY RESPONSES OF RAINBOW TROUT LARVAE TO CARBON MONOXIDE AND TO HYPOXIA,
Toronto Univ. (Ontario). Dept. of Zoology.
G. F. Holeton.
J Exp Biol. 55 (3): 683-694. 1971.
Identifiers: *Carbon monoxide, Circulatory response, *Hypoxia, Mon., Oxide, *Rainbow trout, Respiration, *Tachy cardia, *Trout larvae.

The respiration and circulation in rainbow trout larvae was examined for the first three weeks after hatching. Breathing became steadily stronger, heart rate first increased then decreased probably due to establishment of inhibitory control. Larvae exposed to hypoxia or CO responded to both with tachycardia and an increase in breathing. It is proposed that the bradycardia response of adult trout to hypoxia is a superimposed response relating circulation to the quantity of oxygen presented to the gills, and that this reflex is not functional in larvae for at least 8 days after hatching.--Copyright 1972, Biological Abstracts, Inc.
W72-14146

THE INFLUENCE OF ZALA RIVER ON THE BACTERIOLOGICAL CONDITION IN KESZTHELY-BAY (LAKE BALATON),
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
Janos Olah.
Ann Inst Biol (Tihany) Hung Acad Sci, 38: 161-166, 1971, Hungarian summary.
Identifiers: Bacteriological conditions, Bays, Hungary, *Keszthely-Bay, Lake Balaton, *Planctomyces, Zala River, *Zoogloea, *Heterotrophs.

In Zala River at the time of the water bloom, the number of heterotrophs was very low (1.5-2.7 1000 cells/ml). In the Keszthely-Bay receding from the inflow, the quantity of both the heterotrophic and the total microbial plankton decreased. The high numbers of Planctomyces bekefii (3 . 10000 colonies/ml) and Zoogloea (1.5 . 10000 colonies/ml) detected in Zala River was absent from the plankton of the Keszthely-Bay. In the lake, the microbial biomass transported by the river decomposed quickly. Together with the mineralization of the algal biomass, the number of heterotrophs was very high (13-20 . 10000 cells/ml) in Zala River. In the Keszthely-Bay the number of heterotrophs was also high (3.1-12 . 10000 cells/ml) owing to the decreased mineralization capacity of the water indicating that the decomposition of the high microbial biomass originating from Zala River was slow and prolonged. Colonies of Planctomyces and Zoogloea were absent from the plankton.--Copyright 1972, Biological Abstracts, Inc.
W72-14154

REACTION OF SOIL FUNGI AND OTHER MICROORGANISMS TO VARIOUS LEVELS OF NITROGEN FERTILIZATION AND IRRIGATION OF COCKSFOOT (DACTYLIS GLOMERATA L.). (IN POLISH),
Z. Maciejowska-Pokacka.
Acta Mycol, 7 (1): 41-57, Illus, 1971, English summary.
Identifiers: *Cocksfoot-M, Dactylis-Glomerata-M, Fertilization, *Fungi, Irrigation, Microorganisms, *Nitrogen, Organisms, Penicillium-Janthinellum, Penicillium-Nigricans, Soil, Trichoderma, Yeast like fungi.

The soil was maintained at 2 different levels of humidity and fertilized with high rates of N. Soil fertilized with 90 kg N/ha x 4 had more microorganisms than the control. In May on non-irrigated plots and in March on irrigated plots fertilized with 270 kg N/ha x 4 the number of microorganisms increased much. Most microorganisms were most active in May. There were no great differences in the number of microorganisms on irrigated and non-irrigated. The fungal flora was least numerous in May. Fungi reacted strongly to N fertilization. Development on non-irrigated plots was better than on irrigated plots. On non-irrigated plots fertilized with 2 higher rates of N (180 and 270 kg N/ha x 4), a particularly high increase of the number of fungi was observed. Most frequent were the species Penicillium janthinellum and P. nigricans. A similar situation occurred on fertilized and irrigated plots. On plots with a higher level of humidity best development occurred at the fertilization level of 90 kg N/ha x 4. P. janthinellum and P. nigricans were most frequent in the autumn. Trichoderma and yeast-like fungi developed best in spring. Reaction of various fungi to various rates of N was different. Reddish-yellow isolates of P. janthinellum, which occurred frequently in fertilized soil are described.--Copyright 1972, Biological Abstracts, Inc.
W72-14158

CLADOCERA STUDIES ON LAKE BALATON: IV. SUBFOSSIL REMAINS IN THE SEDIMENTS OF LAKE BALATON II,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
For primary bibliographic entry see Field 02H.
W72-14160

GLASS EFFECT AND THE MICROBIAL PLANKTON-SESTON RELATION IN THE WATER OF LAKES BALATON AND BELSO,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
Janos Olah.
Ann Inst Biol (Tihany) Hung Acad Sci, 38: 153-160, 1971, Hungarian summary.
Identifiers: Bacteria, *Lake Balaton, *Lake Belso, *Glass effect, Hungary, Lakes, *Trophic level, Microbial plankton, Seston, Water pollution effects.

The water of lakes Balaton and Belso with different trophic levels and the significance of the glass effect were indicated by the values of S; the proportion between the highest number of bacteria and the initial number of bacteria were measured during incubation. In the filtered water the values of S were always larger than those in the unfiltered

water and increased together with the increasing organic matter content in the media employed in detecting the glass effect. In the filtered water of Lake Balaton the values of S were higher by 2 orders of magnitude, than those in the water of the highly eutrophic Lake Belso. This suggests a direct relation between the significance of the glass effect and the trophic level. In Lake Balaton 56% of the total microbial plankton was attached to the seston. For heterotrophic microorganisms this percentage increased to 96. In Lake Belso the seston-attachment was smaller (45 and 84%). The differences between the 2 lakes were even higher in the case of the attachment to inorganic seston.--Copyright 1972, Biological Abstracts, Inc.
W72-14161

THE HORIZONTAL DISTRIBUTION OF ROTIFERA PLANKTON IN LAKE BALATON,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
Nora P. Zankai, and Jeno E. Ponyi.
Ann Inst Biol (Tihany) Hung Acad Sci, 38: 285-304, Illus, 1971, Hungarian summary.
Identifiers: Asplanchna-Girodi, *Lake Balaton, Encentrum-Wiszniewszki, *Hungary, Lakes, Plankton, Records, *Rotifera plankton, Trichocerca-Rousseleti.

The Rotifera plankton of the open water of the lake was composed by 40 spp., varieties and forms during 2 yr (1966-67). Three of them (Encentrum wiszniewszki Wulfert, Trichocerca rousseleti (Voigt) and Asplanchna girodi de Guerne) are new to the fauna of Hungary whereas Brachionus diversicornis (Daday) is new for that of Lake Balaton. Qualitative investigations proved that 5 spp. (Keratella cochlearis, K. cochlearis tecta, K. quadrata, Polyarthra vulgaris, Pompholyx sulcata) can be considered as the main elements of the open water in Lake Balaton. On the basis of their horizontal distribution, the species were classified into 4 groups: a = those found in the open water of the whole lake, being of nearly uniform in distribution; b = those found only in the north-eastern basin and showing a higher percentage there, respectively; c = those found only in the southwestern basin and showing a higher percentage there, respectively; d = those living in the Keszthely-Bay. On the basis of percentage distribution of the dominant species as well as of Marczewski-Steinhaus index, 3 areas can be distinguished in the open water of Lake Balaton: (a) north-eastern basin ('E-A' sections), (b) Keszthely-Bay and Szigliget-Bay ('M-K' sections), (c) 'G' section of the south-western basin can sometimes be assumed to belong to the north-eastern part while at other times to the 'K' section. The richest region in species was the Keszthely-Bay and its surrounding. Taxa found here are characteristic mainly for the strongly eutrophic waters.--Copyright 1972, Biological Abstracts, Inc.
W72-14163

THE EFFECT OF CERTAIN CHLORINATED ORGANIC PESTICIDES ON HYGIENIC INDICATORS OF WATER,
G. Zamfir, A. Simona, M. Filipiuc, L. Alexa, and C. Melinte.
Z Gesamte Hyg Grenzgeb, 17 (10): 734-740, Illus, 1971, Russian summary.
Identifiers: Bacteria, *Chlorinated pesticides, Daphnia, Hygienic indicators, Pesticides, Water pollution effects, *Detox, *Lindatox.

The effect of small concentrations (0.02 mg, 0.2 mg, and 2 mg active substance/l) of Detox and of Lindatox on hygienic water indicators was determined. These pesticides raised the values of certain water pollution indicators like the biological O2 demand, oxidability and bacterial flora. A short initial period of inhibition of algal growth is followed by their accelerated growth. The pesticides were simultaneously found highly toxic to Daphnia. In view of these findings the maximal permissible concentration of these pesticides in water must be set lower.--Copyright 1972, Biological Abstracts, Inc.
W72-14164

FUNCTIONAL MODEL OF THE LAKE ECOLOGICAL SYSTEM (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Institut Evolyutsionnoi Fiziologii i Biokhimii.
V. V. Menshutkin.
Zh Obshch Biol, 32 (2): 163-168, Illus, 1971, English summary.
Identifiers: *Bacteria, *Computer models, Ecology, Fish, *Lake models, Plankton, Heat balance, Thermal regime.

A generalized model of the lake ecological system was made on a digital computer. The model involves the elements of heat balance, the thermal regime and pattern of biogenic elements as well as the characteristics of the activity of phytoplankton, predatory and non-predatory zooplankton, bacteria, benthic organisms, fishes, planktophages and benthophages, and predatory fishes. The function of the model is exemplified in changes in the wind regime over the lake surface and intensification of fishery of benthophages. In the former case, the transitory period duration is limited by 2 yr and in the latter, is prolonged beyond 10 yr. The suggested method of modelling is convenient for summarizing data on separate elements of the lake ecosystem. Such models are suitable for qualitative prognosis of after-effects in the lake ecosystem.--Copyright 1972, Biological Abstracts, Inc.
W72-14167

THE HYDROLOGICAL CONDITIONS OF AMBARO BAY (NORTHWESTERN MADAGASCAR): CONTRIBUTION TO THE STUDY OF A TROPICAL EUTROPHIC BAY, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Nosy Be (Madagascar). Centre Oceanographique (ORSTOM) de Nosy-Be.
B. Piton, and Y. Magnier.
Cah O.R.S.T.O.M. (Off Rech Sci Tech Outre-Mer) Ser Oceanogr. 9 (2): 149-166. Illus. 1971. English summary.
Identifiers: *Ambaro Bay, *Eutrophication, *Madagascar, Seasonal, *Tropical bays, Salinity, Estuarine environment.

The results of a 2 yr survey in Ambaro Bay suggest that the circulation changes from estuarine to anti-estuarine pattern according to the meteorological influences of the wet or dry season. Net fluxes of salt and water were calculated.--Copyright 1972, Biological Abstracts, Inc.
W72-14182

ECOLOGIC STUDY OF TWO SMALL PONDS IN THE ENVIRONS OF WEVELGEM (WEST FLANDERS),
Ghent Rijksuniversiteit (Belgium). Laboratorium voor Oecologie.
P. Sorgeloos.
Biol Jaarb. 38: 188-208. Illus. Map. 1970.
Identifiers: *Belgium, Cladocera, Copepoda, Ecology, Environment, Flanders, *Lepocinclis-Texta, *Phytoplankton, Ponds, *Trachelomonas-Sp, Wevelgem.

Samples were taken monthly of the water in the 2 nearby ponds and these were examined for temperature, transparency, pH, dissolved O2, plant and animal plankton. The 'Park' pond was low in O2, which was probably because of the low phytoplankton content. Cladocera and Copepoda were dominant in the zooplankton. The presence of these crustacean organisms depends, not on physical and chemical characteristics of the water, but on the presence of food such as Lepocinclis texta and Trachelomonas spp. Phytoplankton predominated in the 'College' pond.--Copyright 1972, Biological Abstracts, Inc.
W72-14187

OIL AND THE ECOLOGY OF THE ARCTIC,
Alberta Univ., Edmonton. Dept. of Botany.
L. C. Bliss.
Trans R Soc Can. 8: 361-372. Illus. 1970.
Identifiers: *Arctic, *Ecology, *Oil pollution, Environmental effects.

The ecological problems presented by large-scale arctic operations and the means of lessening the impact of these operations so as to maintain a favorable arctic environment for future generations are discussed.--Copyright 1972, Biological Abstracts, Inc.
W72-14188

5D. Waste Treatment Processes

SWINE WASTE CHARACTERIZATION AND EVALUATION OF ANIMAL WASTE TREATMENT ALTERNATIVES,
North Carolina Water Resources Research Inst., Raleigh.
F. J. Humenik.
Available from the National Technical Information Service as PB-211 807, $3.00 in paper copy, $0.95 in microfiche. North Carolina State Water Resources Research Institute, Raleigh, Report No 61, June 1972 (UNC - WRRI-72-61), 152 p. 19 fig, 41 tab, 48 ref, 3 append. OWRR A-048-NC (3).

Descriptors: *Farm wastes, *Waste water treatment, *Waste identification, Analytical techniques, *Farm lagoons, *Denitrification, Waste treatment, *Biochemical oxygen demand.
Identifiers: *Swine wastes, *BOD5.

The influence of feed additives chlorotetracycline, copper and zinc concentrations and sample dilution on BOD5 analysis was investigated for swine feces, lagoon influent and lagoon effluent. Variation of BOD5 with sample concentration was also investigated for synthetic sewage and animal waste samples without inhibitory feed additives. Analyses of experimental data showed that BOD5 results depend upon sample history, type and amount of seed organisms, incubation conditions and sample size. Work was conducted to correlate BOD5 results with other chemical or instrumental tests and develop tehcnically sound methods for evaluating the oxygen demand or pollutional potential of animal waste. Data correlations and characterization values for instrumental chemical oxygen demand analyzer and organic carbon analyzer were developed. Recommendations for obtaining accurate and consistent characterization data for animal waste and suggestions for obtaining the most reliable BOD5 results are presented. Laboratory work was conducted on suitability of procedures outlined in Standard Methods for Examination of Water and Wastewater (1971) and alternative analytical techniques for the characterization of animal wastes. Animal waste treatment alternatives were investigated. Operation data for single unaerated swine waste lagoon, two unaerated lagoons in series, and packed soil lysimeters for land disposal of lagoon effluent were anlyzed. Lysimeter work on the land application of liquid dairy manure also initiated. Lysimeters were operated as natural flow-through soil profiles and with a controlled water table. Nitrate formed in the acrobic soil layers could be removed without supplemental organic addition by biological denitrification in the anaerobic zone provided by the controlled water table.
W72-13635

A LITERATURE SEARCH AND CRITICAL ANALYSIS OF BIOLOGICAL TRICKLING FILTER STUDIES-VOL. I.
Dow Chemical Co., Midland, Mich. Functional Products and Systems.

Copy available from GPO Sup Doc EP2.10:17050 $2.50; microfiche DDY 12/71, from NTIS as PB-211 909, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, December 1971. 341 p, 8 fig, 6 tab. EPA Program 17050 DDY 12/71.

Descriptors: *Trickling filters, *Bibliographies, *Biological treatment, Aerobic treatment, Filters, Treatment facilities, Industrial wastes, Municipal wastes, Theoretical analysis, Construction, Operation and Maintenance, Patents, Pollution abatement, *Waste water treatment, Chemical wastes, Pulp and paper industry, Radioactive wastes.
Identifiers: Biological filters, Biofilters, Percolating filters, Sprinkling filters, Brewery and distillary wastes, Gas and coke plant wastes, Food processing wastes, Institutional and military wastes, Milk processing wastes, Pharmaceutical wastes, Meat and poultry wastes, Tannery and textile wastes, Metal working and production wastes.

A compilation, review and critique of the literature on biological trickling filter studies and related pollution abatement processes have been made. Volume I, the literature review and critical analysis, is divided into: (a) Introduction, Definitions, History and Background Theory of the Trickling Filter Process; (b) Plant Design, Materials of Construction, Operation, Maintenance and Performance; (c) Trickling Filter Research and Development Approaches, Ecology, and Patents, and (d) Application of Trickling Filter to Specific Industrial Wastes. Based on the review, several general conclusions were drawn. There is no well-defined theory of design and operation. Much published work was redundant, and European efforts were not readily accepted in the United States, and vice versa. The literature reflects cycles of interest in trackling filters. The value of much of the early work was ignored. Solutions to complex pollution problems will be made by industry strongly supported by local, state and Federal governments. The filter will be used in high efficiency, modern wastewater treatment plants. The process is not applicable to all pollution problems, but its shock survival capabilities and rapid flow-through time are definite advantages which cannot be overlooked in any design of a waste treatment facility. (See also W72-13639) (Galwardi-Texas)
W72-13638

VIRUS REM OVAL BY CHEMICAL COAGULATION,
Tennessee Univ., Knoxville. Dept. of Civil Engineering.
S. P. Shelton, and W. A. Drewry.
Available from University of Tennessee. Dept. of Civil Engineering, Knoxville, Price: $3.00, Water Resources Research Center, Report No. 15, December 1971, 111 p., 28 fig, 42 tab, 23 ref.

Descriptors: *Viruses, *Chemical precipitation, *Coagulation, *Bacteriophage, *Waste water treatment, Performance, Laboratory tests, Economic feasibility.
Identifiers: Aluminum sulfate, Ferric chloride, Ferric sulfate, Sodium, Aluminate, Cationic polyelectrolytes, f2 bacteriophage.

The removal of f2 bacteriophage by chemical coagulation was investigated. Aluminum sulfate, ferric chloride, and ferric sulfate were the most effective coagulants tested, all removing over 99% of the virus in at least one of the two waters tested. Cationic polyelectrolytes were unsatisfactory as primary coagulants because of their inability to form a good floc. Cationic, nonionic and anionic polyelectrolytes with aluminum sulfate improved coagulation bust were not economically feasible. Sodium aluminate when used in conjunction with aluminum sulfate was effective for virus removal. However, the optimum dosages required for turbidity and COD reduction did not correspond to the optimum dosage required for virus removal. (Galwardi-Texas)
W72-13684

AN EXAMPLE OF ECONOMIC PLATING WASTE TREATMENT BY REVERSE OSMOSIS,
Ontario Research Foundation, Sheridan Park. Dept. of Physical Chemistry.
A. Golomb.
Preprint, presented at 6th International Water Pollution Research Conference, Session 2, Hall B, Paper No. 3, June 19, 1972, 11 p, 3 fig, 3 tab, 6 ref.

Descriptors: *Reverse osmosis, *Industrial wastes, *Reclaimed water, *Estimated costs, Efficiencies, Performance, Laboratory tests, Pilot plants, Membranes, Cellulose, Dissolved solids, Treatment facilities, *Waste water treatment.
Identifiers: Electroplating industry, Nickel, Rinse waters, Closed loop system, Dragout losses, Product recovery.

On the basis of laboratory studies and subsequent plant trials on an industrial plating line, Watts nickel plating rinse waters were effectively treated by reverse osmosis to reclaim reusable materials. Cellulose acetate membranes were used to recover greater than 99% of nickel values from the waste rinse streams. For nickel dragout losses associated with the plating operation of 15, 50 and 500 gal/day projected cost estimates indicated capital investment payback periods of the order of 39, 13, and 4 months, respectively. Cost estimates were arranged in tabular form. In addition to the favorable economic aspects, the 'closed loop' reverse osmosis reclamation system can make a significant contribution toward eliminating unnecessary discharge of contaminants and total dissolved solids into the environment. (Galwardi-Texas)
W72-13687

HIGHER BOD REMOVAL VIA CHEMICAL ADDITIVES.

Chemical Engineering, Vol 78, No. 16, July 12, 1971, 1 p.

Descriptors: *Treatment facilities, *Municipal wastes, *Chemical precipitation, Activated carbon, Settling basins, Vacuum drying, *Virginia, *Biochemical oxygen demand, Waste water treatment.
Identifiers: Ferric chloride, Polyelectrolytes.

A new wastewater treatment system installed at the Westgate Sewage Plant in Fairfax County, Virginia, has enabled the plant to comply with standards set by the Virginia State Water Control Board requiring BOD5 removal to be upgraded to at least 75%. The process involved adding powdered activated carbon, ferric chloride, and organic polyelectrolytes to the effluent of the primary clarifiers. Since little or no construction was required, the process is cheaper in the short run than building conventional or tertiary treatment plants. (Galwardi-Texas)
W72-13689

MACRORETICULAR RESINS-A SOLUTION TO AGGRESSIVE CONDITIONS,
W. A. Segar.
Effuent and Water Treatment Journal, Vol 9, No 8, August 1969, p 433-438. 4 fig, 2 tab, 11 ref.

Descriptors: *Ion exchange, *Resins, *Industrial water, *Chemical degradation, Colloids, Size, Water treatment, *Waste water treatment.
Identifiers: *Macroreticular resins, Pore size, Aggressive conditions, Acrylic matrices, Industrial applications.

The development of a macroreticular resin has facilitated the application of ion exchange under conditions where standard gel materials would undergo chemical or physical degradation. In addition it has made possible the preparation of certain types of ion exchange resins which could not be satisfactorily manufactured using a gel matrix or were not previously capable at all of being prepared. An example of the former is Amberlite IRA-93, a tertiary amine weak base resin, and an example of the latter is Amberlite XE-238, a resin having pore sizes of the order of 100,000 Angstrom units. Amberlite XE-238 has been prepared for the removal of colloids including colloidal silica from water and shows much promise in the production of pure water for food preparation, power generation, and transistor washing. Another approach to the problem of aggressive conditions is the use of anion exchangers based on acrylic matrices such as Amberlite IRA-68 which has been applied in the food, pharmaceutical, and chemical processing industries as well as for the treatment of water and tertiary sewage. (Galwardi-Texas)
W72-13690

SPRINKLER IRRIGATION SYSTEM SOLVES WASTE WATER PROBLEMS.

Journal of Technical Association of Pulp and Paper Industry, Vol 55, No. 7, p 1016, July 1972.

Descriptors: *Industrial wastes, *Pulp and paper industry, *Irrigation systems, *Waste water disposal, Size, Cost comparisons, Capital costs, Operating costs, *Michigan.
Identifiers: *Sprinkler irrigation system, Watervliet paper company.

The Watervliet (Michigan) Paper Company plans to install a sprinkler irrigation system which will handle 900,000 gallons per day of wastewater. The project calls for wastewater to be pumped through underground pipes and spray irrigated over 90 acres. This irrigation method is slightly less expensive than development of a waste treatment plant. However, yearly operating and maintenance costs will be substantially less. (Galwardi-Texas)
W72-13691

PROCESS MODELING OF BIOLOGICAL WASTE TREATMENT,
Texas Univ., Austin. Dept. of Chemical Engineering.
D. M. Himmelblau, and E. F. Gloyna.
Available from the National Technical Information Service as AD-739 992, $3.00 in paper copy, $0.95 in microfiche. Final Report, U. S. Army Medical Research and Development Command, March 10, 1972. 76 p., 26 fig., 13 tab, 59 ref. DADA 17-69-C-9073

Descriptors: *Biological treatment, *Mathematical models, *Mixing, *Kinetics, Aeration, *Waste water treatment, Tracers, Laboratory tests, Laboratory equipment, Statistical methods, Model studies, *Aerated lagoons.
Identifiers: *Residence time distribution functions, Radioactive counting, Steady state operations, Transient responses.

Work was undertaken to represent and identify mathematical models of biological waste treatment as applied to a laboratory sized aeration basin. Studies were carried out with respect to both the mixing and to the kinetics of biological oxidation reactions. Estimation schemes other than least squares were essential because least squares in many instances could not evaluate the model parameters. The proposed treatment of the microbial reactions was one that accounted for the individual components of the substrate but not the components of

the microbial population. Validity of the suggested model was demonstrated in both batch and continuous laboratory aeration tanks. When introduced into models of wastewater treatment processes the kinetic portion of the model represented the laboratory data quite well. The proposed model not only represented steady state operations, but also transient responses caused by changes in plant loading and process upsets. (Galwardi-Texas)
W72-13694

INTERPRETATION OF TRACER TESTS ON SEDIMENTATION TANKS,
Michigan Univ., Ann Arbor. Dept. of Water Resources.
G. W. Brumo.
Journal of the Technical Association of Pulp and Paper Industry. Vol 55, No. 7, July 1972, p 1097-1102, 11 fig, 7 ref.

Descriptors: *Sedimentation, *Settling basins, *Waste water treatment, *Tracers, Mathematical models, Mathematical studies, Hydraulics, Mixing.
Identifiers: Clarifiers, Plug flow, Step input technique, Pulse input technique, Short circuiting, Dead spaces.

The gross hydraulics and the reasons for inefficiency of solids removal in wastewater clarifiers were investigated by introduction of a tracer. Theoretical responses to a step tracer input to a number of plausible flow models of continuous flow settling basins were reviewed. Models of simple and multistage basins which exhibit various degrees of plug flow, mixing, short circuiting, dead spaces, or combinations of these modes were examined. The use and interpretation of the pulse input technique was also treated. Possible causes for departure from ideal plug flow behavior were discussed from a hydraulic viewpoint. The usefulness of the theoretical flow models was illustrated by comparison with an actual tracer test on a clarifier using step input method. (Galwardi-Texas)
W72-13696

OXYGEN UPTAKE AND MECHANISM OF SUBSTRATE PURIFICATION IN A MODEL TRICKLING FILTER,
Cornell Univ., Ithaca, N.Y.
P. Monadjemi.
Available from University Microfilms, Ann Arbor, Michigan, Order No. 69-7291, Microfilm $3.00, Xerox $7.00. Ph. D. Dissertation, September 1968, 146 p.

Descriptors: *Trickling filters, *Mathematical model, *Dissolved oxygen, *Depth, Flow rate, Chemical oxygen demand, Slimes, Laboratory tests, Laboratory equipment, Performance, *Waste water treatment.
Identifiers: Molecular diffusion coefficient, Oxygen uptake rate, Slime-liquid interface, Removal coefficient.

The trickling filter was considered in terms of individual elements of the filter media over which laminar flow occurs. The flow of liquid waste from one element to another was assumed to be accompanied by mixing at the point of contact of various elements. An equation which takes into account the importance of the number of mixings which occur in a vertical chain of the filter was proposed. This equation incorporated such factors as total depth, depth of individual elements in the filter, molecular diffusion coefficient, hydraulic flow rate and the removal coefficient across the slime-liquid interface. It was observed that oxygen uptakes per unit weight of slime were less in trickling filters than in activated sludge. A linear relationship was observed between oxygen uptake and COD removal. Dissolved oxygen profiles in the filter resembled that of oxygen sag in streams with lowest D.O. occurring in mid-portion of the filter. The experimental results were applied to the mathematical model and the coefficient of removal of substrate across the slime-liquid interface was calculated. (Galwardi-Texas)
W72-13697

THE REMOVAL OF RADIONUCLIDES FROM WATER BY HYDROUS FERRIC OXIDE,
Rensselaer Polytechnic Inst., Troy, N.Y.
W. M. McLellon.
Available from University Microfilms, Ann Arbor, Michigan, Order No. 67-12,840, Microfilm $4.80, Xerox $16.90. Ph. D. Dissertation, 1967, 374 p.

Descriptors: *Colloids, *Iron oxides, *Radioisotopes, *Hydrogen ion concentration, *Electrophoresis, Cesium, Iodine radioisotopes, Sodium, Sulfur, Efficiencies, *Waste water treatment.
Identifiers: Hydrous ferric oxide, Removal efficiencies, Ferric chloride coagulant, Freundlich isotherm, Electrophoretic mobility.

Colloidal properties of hydrous ferric oxide, prepared under a variety of system conditions, were investigated. Additionally, the use of hydrous ferric oxide in the removal of radioactive solution ions was examined, using 137Cs (+), 22Na (+), (131)I (-), and 35S (as SO4 (-2)). Removal of radioactive ions was correlated with pH and with the electrokinetic properties of colloidal particles formed. The maximum 137Cs (+) removal was 2.1%, the maximum sodium removal was 1.3%. These occurred at maximum negative electrophoretic mobility. The maximum (131)I (-) removal was 40% at pH 4.0. Iodide removal using a FeCl3 coagulant conformed to a Freudlich isotherm for concentrations of 10 to the minus 13th power and 10 to the minus 7th power molar. The maximum 35S (as SO4 (-2)) removal was 9.4% at pH 4.0. A linear relation was found to exist between cation removal and electrophoretic mobility of hydrous ferric oxide particles with a sharp break occurring at the pH of change from stable colloid to flocculant state (pH 9-10). (Galwardi-Texas)
W72-13699

BIODEGRADATION OF SYNTHETIC DETERGENTS EVALUATION BY COMMUNITY TRIALS: 1. LINEAR ALKYLBENZENE SULFONATES,
Shell Research Ltd., Egham (England). Egham Research Labs.
A. H. Mann, and V. W. Reid.
Journal of American Oil Chemist's Society, Vol 48, No 10, October 1971, p 588-594. 2 fig, 8 tab, 17 ref.

Descriptors: *Biodegradation, *Linear alkylate sulfonates, *Trickling filters, Aeration, Effluents, Degradation (Decomposition), Laboratory tests, *Waste water sampling, Treatment, On-site tests.
Identifiers: Open-bottle die-way test, Molecular weight, Paraffins, Olefins.

The biodegradability of a number of linear alkylbenzene sulfonates (LAS) has been evaluated by field trials with a trickling filter sewage plant serving a small community. All the LAS material examined showed a satisfactory order of biodegradability, however, aeration of the sewage effluent resulted in further biodegradation to a degree corresponding to 96 to 99% degradation in the LAS present in the settled sewage. The results of laboratory scale biodegradation tests were largely in agreement with those obtained in the field trials. However, with tests of the simple open bottle type, misleading indications of low biodegradability were sometimes obtained on products of higher molecular weight. Such products did not appear to acclimatize rapidly to bacteria under the conditions of the open bottle test. There were only minor differences in biodegradability between as LAS derived from paraffins and those derived from cracked olefins. (See also W72-07148 and W72-07149). (Galwardi-Texas)
W72-13703

PROCEEDINGS OF THE LAND SPREADING CONFERENCE AT ORLANDO, FLORIDA ON JULY 15, 1971.
East Central Florida Regional Planning Council, Winter Park.

Available from the National Technical Information Service as PB-204 176, $3.00 in paper copy, $0.95 in microfiche. 1971 P. B. Rhoads and C. W. Sheffield, editors, 137 p.

Descriptors: *Conferences, *Tertiary treatment, *Municipal wastes, Education, Research and development, Infiltration, Percolation, Permeability, Filtration, Soil texture, Forage grasses, Grains (Crops), Nutrient requirements, *Waste water treatment, *Florida, *Waste disposal.
Identifiers: *Effluent land spreading.

The primary factors in land disposal of secondary municipal effluent include: (a) soil characteristics; (b) cover crop characteristics; (c) depth of the water table; and (d) soil-water-plant relationships. At present, 1300 installations in the United States are practicing land spreading of treated municipal effluent, of which one-third rely principally on filtration, and the other two-thirds utilize both filtration, and percolation. Effluent or drainage from land spreading operations has been used for industrial or agricultural pruposes, groundwater recharge, and other uses. Although permanent design criteria have not been established, this fact has been due mainly to the need for individual evaluation and testing of each individual installation occasioned by the wide variation in environmental conditions from one location to another. However, results of investigations presented have indicated careful, planned management of natural purification processes to be a viable and economical alternative to in-plant tertiary treatment. (See W72-13705 thru W72-13712). (Lowry-Texas)
W72-13704

BASIC PRINCIPLES OF ADVANCED WASTE TREATMENT,
Florida Technological Univ., Orlando. Dept. of Civil Engineering and Environmental Sciences.
W. M. McLellon.
In: Proceedings of the Land Spreading Conference, Orlando, Florida, July 15, 1971, p 2/1-2/8, 8 ref.

Descriptors: *Tertiary treatment, *Water reuse, *Water purification, *Suspended solids, Adsorption, Separation techniques, Biochemical oxygen demand, Nutrients, Stream assimilative capacity, Disinfection, Chlorination, Bacteria, Viruses, Recreation, *Waste water treatment.

Public interest concerning the degradation of the nation's waterways has stimulated much interest and investigation in the water cycle. Realization that the water resource is no longer infinite with respect to waste inputs has initiated first a demand for primary, then secondary, and now tertiary treatment stages for municipal wastes. Interest is also focusing on re-use of wastewater for both non-potable and potable uses. Tertiary treatment systems fall into the categories of physical, chemical or biological, as do secondary treatment systems. The main objectives in tertiary treatment have been enhanced BOD and SS removals, nitrogen and phosphorus removals, and bacteria and viral removals. Recent interest has been manifested in the use of natural processes for tertiary treatment, in the form of polishing ponds. However, natural processes must be rididly controlled and uncertainties arise concerning the relation of hydraulic and organic loadings, as well as cover crop type or organism type in nutrient

removal. The transmission and fate of viruses are also important factors which will require considerable research effort to determine. (See also W72-13704). (Lowry-Texas)
W72-13705

SOIL SUITABILITY FOR SPRAY IRRIGATION,
Soil Conservation Service, Cocoa,Beach, Fla.
H. F. Huckle.
In: Proceedings of the Land Spreading Conference, Orlando, Florida, July 15, 1971. p 3/1-3/11, 4 fig, 5 ref.

Descriptors: *Sprinkler irrigation, *Waste water treatment, *Soils, Sands, Silts, Clays, Porosity, Soil texture, Soil-water-plant relationships, Rooting zone, Wilting point, Vegetation effects, Infiltration, Permeability, Percolation, Seepage, Water table, Temperature, Florida.
Identifiers: *Available water capacity.

Factors determining the suitability of a particular soil for spray irrigation treatment of wastes include the infiltration rate of the soil, permeability of the soil profile, available water capacity of the soil, slope, and drainage or depth of the water table. Infiltration rate, permeability, and available water capacity are largely a function of the soil texture. As silt and clay content in a soil increases, pores become blocked, causing decreased permeability and infiltration rates, but increased available water capacity. In system design, frequency of application of the irrigation water is a function of the vegetative cover or crop, depth of the rooting zone, and available water capacity of the root zone. Several examples comparing sands and loams with varying levels of silt and clay as to their spray irrigation applicability are presented. (See also W72-13704). (Lowry-Texas)
W72-13706

PLANTS AND WASTEWATER RENOVATION,
Florida Univ., Gainesville. Dept. of Soil Science.
C. Hortenstine.
In: Proceedings of the Land Spreading Conference, Orlando, Florida, July 15, 1971. p 5/1-5/6, 14 ref.

Descriptors: *Sprinkler irrigation, *Waste assimilative capacity, *Vegetation effects, *Rates of application, Nutrients, Phosphorus, Nitrogen, Infiltration, Percolation, Eutrophication, Research and development, Municipal wastes, Tertiary treatment, *Waste water treatment, Suspended solids.

1300 WASTEWATER TREATMENT SYSTEMS USING WASTEWATER APPLICATIONS TO CROPLANDS ARE CURRENTLY OPERATING IN THE United States. Cover crops which are being irrigated include sorghum, wheat, barley, cotton, oats, citrus, corn, soybeans, and pasture grasses. The main objectives of spray irrigation tertiary treatment include: (a) removal of organic particles and plant nutrients from the return water; (b) provision of water for plant growth; and (c) provision of nutrients for plant growth. In applying 2 inches of wastewater per week on a silty clay loam, Pennsylvania State University researchers reported deposition of 700 lbs of nitrogen, 372 lbs of phosphorus, and 942 lbs of potassium on the soil annually. Numerous other studies are discussed, with varying loading rates on the soil, but each investigation further demonstrated that a spray irrigation system, with periodical harvesting of the cover crop, can be operated indefinitely under proper management. (See also W72-13704). Lowry-Texas)
W72-13707

ENGINEERING DESIGN CRITERIA FOR SPRAY IRRIGATION,
Bishop (William), Talahassee, Fla.
M. Bishop.
In: Proceedings of the Land Spreading Conference, Orlando, Florida, July 15, 1971. p 7/1-7/7.

Descriptors: *Sprinkler irrigation, *Design criteria, *On-site investigations, Research and development, Municipal wastes, Vegetation effects, Infiltration, Percolation, Eutrophication, *Waste water treatment.

The first spray irrigation wastewater treatment installation for tertiary treatment of secondary municipal effluent in Florida was designed in 1964. The soil consisted of fine to medium grain quartz sand to a depth of at least 22 ft., and the water table was below 22 ft. Cover on the site was black jack oak and pine trees. Design loading of 125,000 gallons/acre/day was based on the recommended loading on a relatively slow sand filter. Two 8 acre fields were provided, so that they might be alternated at 24 hrs dosage and 24 hrs resting. A holding pond was also included with 2 1/2 days detention time, for use as a holding pond or polishing pond in the event of a malfunction. Because of the variability in local conditions, there are no standard design procedures to follow, but each individual installation must be designed specifically for each application. (See also W72-13704). (Lowry-Texas)
W72-13709

ACTUAL SPRAY FIELD OPERATIONS,
T. P. Smith.
In: Proceedings of the Land Spreading Conference, Orlando, Florida, July 15, 1971, p 8/1-8/4.

Descriptors: *Sprinkler irrigation, *On-site investigations, *Cost analysis, Operation and maintenance, Infiltration, Percolation, Vegetation effects, Nutrients, Municipal wastes, Nozzles, Water quality control, *Waste water treatment.

The Tallahassee spray irrigation fields, for the treatment of secondary municipal effluent, became operative in 1966 with an initial flow of 0.25 mgd. Because of seepage through the bottom of a holding pond, no effluent was available for irrigation until the pond was by-passed. Loading rates were then set at 300,000 gallons/acre/day. At high loading rates, orthophosphate concentration dropped from 25 ppm at the surface to 0.04 ppm at a depth of 24 inches, while conversion of ammonia nitrogen to nitrate was essentially complete at the same depth. Experiments with undisturbed forest and plowed ground demonstrated the tendency of the plowed ground to pond very easily. Costs of irrigation at 1 mgd flow averaged $25.00/mg of which $15.00 went for electric power and $10.00 for pump, sprinkler system, and field maintenance. (See also W72-13704) (Lowry-Texas)
W72-13710

WASTEWATER RENOVATION AT TALLAHASSEE - EXPERIMENTAL STUDIES,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
A. R. Overman.
In: Proceedings of the Land Spreading Conference, Orlando, Florida, July 15, 1971, p 9/1-9/8. 3 fig, 1 tab.

Descriptors: *Sprinkler irrigation, *Soil texture, *Water table, Root zone, Absorption, Municipal wastes, Percolation, Infiltration, Permeability, Nutrients, On-site investigations, Forage grasses, Cattle, Nutrient requirements, Tertiary treatment, *Waste water treatment, *Florida.
Identifiers: *Tallassee (Fla).

Factors controlling the successfulness of land spreading of secondary municipal effluent include crop variety, depth to water table, and soil type. Crop variety determines the maximum capacity of the cover crop to absorb nutrients. Soil type has effect through permeability and capacity to hold water and nutrients. Water table depth influences the rooting zone of the plants and the buffer capacity of the soil for heavy rainfall. Field studies at the Tallahassee plant are now being directed towards development of management information for several crops, including sorghum-sudan, kenaf, and Argentine bahiagrass. Application rates of 1,2,4, and 8 inches per week of secondary effluent are being used. Intense harvesting has been necessary to keep up with crop production, and the crops have been proven to be excellent cattle feed. Other experiments, including some with infiltration basins are currently in progress. However, the basic concept of the utilization of natural processes for tertiary treatment is well established. (See also W72-13704) (Lowry-Texas)
W72-13711

SOME ASPECTS OF EFFLUENT LAND-SPREADING,
Dawkins and Associates, Inc., Orlando, Fla.
M. E. Dawkins.
In: Proceedings of the Land Spreading Conference, Orlando, Florida, July 15, 1971, p 10/1-10/11.

Descriptors: *Waste water treatment, *Infiltration, *Percolation, Irrigation, Filtration, Permeability, Nutrients, Forage grasses, Growth rates, Design criteria, Tertiary treatment.
Identifiers: *Effluent landspreading, *Inundation, Flow distribution.

Although there are as yet few definitive parameters for land spreading of municipal secondary effluent, many investigations into the process are continuing. However, the instances reported here are mainly land inundation or grass filtration techniques rather than sprinkler irrigation. An experimental, one acre plot at Lakeland, Florida has been in operation for approximately 2 months with promising results. The plot has a slope of one foot in 200 feet, sloping down from a 200 foot distribution header, piped to allow flow measurement and control, as well as shutting of the entire flow to either side at will. Soil is a mixture of sand and clay, consisting of overburden from a phosphate mining operation, with a very low percolation rate. Hermarthia Altissima, known as African grass, was sprigged on one foot centers and started with the effluent. This particular grass is known to adapt well to wet soil conditions, grow rapidly, and contain sufficient nutrients to make excellent cattle feed. The grass grew well to 2 feet in height, was mowed, and resumed growth at 1 inch/day. These and other field studies have led to widespread interest in land spreading, and designs are proceeding even as information as to design parameters are still being sought. (See also W72-13704) (Lowry-Texas)
W72-13712

REMOVAL OF IMPURITIES FROM TRICKLING FILTER EFFLUENTS BY COAGULATION,
Clemson Univ., S.C. Water Resources Research Inst.
T. M. Keinath.
Available from the National Technical Information Service as PB-212 006, $3.00 in paper copy, $0.95 in microfiche. South Carolina Water Resources Research Institute, Clemson Report No 31, July 1972. 70 p, 27 fig, 1 tab, 33 ref. OWRR A-012-SC (6).

Descriptors: *Waste water treatment, *Coagulation, Chemical precipitation, *Trickling filters, Treatment facilities, Design, Iron compounds, Aluminum, Chemical oxygen demand, *Colloids, Pilot plants, Estimated costs.
Identifiers: *Iron coagulant, *Aluminum coagulant.

The results of this investigation lucidly demonstrated that chemical coagulation with salts of Fe (III) and Al (III) can complement and can substan-

tially enhance the treatment efficiencies of existing wastewater treatment facilities. Effective removals of the hydrophilic organic colloids present in trickling filter effluents were achieved with the Fe (III) coagulant when the pH was adjusted to levels nominally below 6.45 (pHc). Complete restabilization was noted for pH values less than 4.00 (pHs). Similarly, the range of zeta potential over which destabilization occurred was broad and extended from -15 to +10 millivolts, which corresponded closely with the pHc and pHs, respectively. Both laboratory and pilot-plant scale studies showed that consistent removals of COD of 70 to 90 percent could be obtained, despite variations in waste strength and composition. Bacterial cells were destabilized and removed from solution concurrent with coagulation of other colloidal matter. Approximately 89 percent of the viable bacteria initially present were removed at the optimum coagulant dose in the pilot studies. The continuous-flow studies showed removals of total nitrogen and total phosphate of 16 and 85 percent, respectively. Projected chemical costs for this process were estimated at 3 cents per 1000 gallons.
W72-13826

FLOW STABILIZING THROUGH LAMINAR SEPARATION APPARATUS,
Rederi A.B. Nordstjernan, Nynashamm (Sweden) (Assignee).
G. Olgard.
U.S. Patent No 3,552,554, 4 p, 5 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 882, No 1, p 171, January 5, 1971.

Descriptors: *Patents, *Industrial wastes, *Waste water treatment, *Sedimentation, Equipment, *Flotation, *Sewage treatment, *Pollution abatement, Separation techniques, Water pollution, Water pollution treatment.

The invention provides for the continuous separation of material suspended in a liquid, either by sedimentation or flotation. The sewage or industrial waste passes down through a series of parallel inclined units formed of parallel spaced inclined plates on which sediment deposits and then slides down as a layer with a layer of clarified liquid above it. Pockets set at the underside receive the clarified liquid which is drawn off by discharge pipes. (Sinha-OEIS)
W72-13877

LIQUID TREATING APPARATUS,
Wastech, Inc., Houston, Tex.
A. W. Busch.
U. S. Patent No 3,552,570, 4 p, 7 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 882, No 1, p 175, January 5, 1971.

Descriptors: *Patents, *Liquid wastes, *Biological treatment, *Waste water treatment, Water pollution, Microorganisms, Water pollution treatment, *Aeration, Pollution abatement, Equipment, Separation techniques.
Identifiers: Biochemical treatment.

In this equipment there is a large mixing and reaction chamber. The chamber is able to float by reason of the aeration of the liquid in the chamber. There is a clarification and sedimentation section outside the chamber. Rotating arms are provided to create a secondary internal recirculation from the sedimentation section into the mixing chamber for controlling the rate of reaction in the chamber. When the reaction is biological oxidation and excess of micro-organisms is produced and removed under controlled conditions. (Sinha-OEIS)
W72-13878

ACCELERATION UNITS,
Future Products Development Corp., McLean, Va. (Assignee).
B. Ray.
U. S. Patent No 3,552,725, 3 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 882, No 1, p 213, January 5, 1971.

Descriptors: *Patents, *Aeration, *Evaporation, *Oxidation, *Sewage treatment, Waste treatment, *Waste-water treatment, Water pollution, Water pollution treatment, Pollution abatement, Separation techniques, Equipment.

The device for accelerating evaporation and oxidation in a sewage system consists of a frame containing a cylindrical housing, a motor driven fan and a floatable hood attached to the lower end of the housing. The hood maintains the distance between the water level and an air deflector flange at a constant height. A 10-12 inch air inlet extends around the periphery of the hood. A wind velocity of more than 5 miles per hour is simulated allowing evaporation rates of specified gallons per hour. Air is drawn by suction across the surface of the pond and the flange directs the suction so that horizontal motion of air is achieved. (Sinha-OEIS)
W72-13880

RADIATION TREATMENT OF MATERIALS,
A. I. Mytelka, and R. M. Manganelli.
U. S. Patent No 3,553,089, 5 p, 10 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 882, No 1, p 294, January 5, 1971.

Descriptors: *Patents, *Liquid wastes, *Dyes, Ionization, *Oxygen, *Gamma radiation, Chlorides, *Biodegradation, Organic wastes, Hydrogen ion concentration, *Waste water treatment.
Identifiers: Ferrous sulfate.

Liquid wastes discolored by azo dyestuff material and carrying organic compounds are treated with a water-suluble salt of a multivalent metal such as ferrous sulfate to adjust the pH to range from about 9 to 12. The effluent is then subjected to gamma radiation in the presence of oxygen. A chloride ion should be added to the effluent during treatment. (Sinha-OEIS)
W72-13883

EXTRACTING OIL WASTE,
N. H. Wolfe.
U. S. Patent No 3,554,906, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 882, No 2, p 772, January 12, 1971.

Descriptors: *Patents, *Oil pollution, *Oil wastes, Pollution abatement, Water pollution control, *Industrial wastes, *Waste water treatment, Water pollution treatment.
Identifiers: *Refinery wastes, Oil refinery wastes.

The waste water is passed through a packing medium consisting of sand and gravel and then through a solvent which is insoluble in water. The solvent to be used may be acetylene tetrabromide, acetylene tetrachloride and xylene. After passing through the solvent the waste water is then passed through a semiporous mass which is permeable to water but not to the solvent and oil. The water is ready to be discharged without causing pollution of the body into which it is admitted. (Sinha-OEIS)
W72-13888

FLUID SEPARATION,
Phillips Petroleum Co., Bartlesville, Okla. (Assignee).
For primary bibliographic entry see Field 05G.
W72-13890

SEWAGE TREATMENT APPARATUS AND METHOD,
Allis Chalmers Mfg. Co., Milwaukee, Wis. (assignee).
F. M. Welch.
U. S. Patent No 3,557,954, 5 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 882, No 4, p 1490, January 26, 1971.

Descriptors: *Patents, *Sewage treatment, Pollution abatement, *Biological treatment, *Dissolved oxygen, *Waste water treatment, Water pollution treatment, Equipment.

Provides a biological treatment tank having a rotating biological contactor. The mixed liquor is lead into a clarifier or settling tank where effluent and sludge are separated. Both are recycled in series with a reactivating device. The reactivating device may comprise a rotatable two-phase contactor or other suitable means for aeration. The dissolved oxygen content is measured as control on the speed of rotation of the two-phase contactor. (Sinha-OEIS)
W72-13893

CONTROL SYSTEM FOR WASTE WATER TREATMENT PLANTS,
Keene Corp., New York (assignee).
T. A. Rose.
U. S. Patent No 3,558,255, 8 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 882, No 4, p 1563, January 26, 1971.

Descriptors: *Patents, *Waste water treatment, *Treatment facilities, *Control system, Pollution abatement, Water pollution, Water pollution treatment, *Activated sludge, *Aeration, Suspended solids.

In this system a device in one tank detects and measures the concentration of suspended solids and provides an output signal representative of the amount of solids. System components respond to the signals and selectively control operation of a pump and valve in a line interconnecting two of the tanks for returning activated sludge at required flow rates, from one tank to another to aid in the sewage decomposition process, and/or pumping the activated sludge to waste. The control components also control the delivery of air to the tank being treated. (Sinha-OEIS)
W72-13895

TREATMENT OF WASTE LIQUORS FROM PULP AND PAPER MILLS,
Texaco Inc., New York (assignee).
H. V. Hess, and E. L. Cole.
U. S. Patent No 3,558,426, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 882, No 4, p 1595, January 26, 1971.

Descriptors: *Patents, *Industrial wastes, *Pulp wastes, Liquid wastes, Pulp and paper industry, *Waste water treatment, Water pollution, Pollution abatement, Treatment, Equipment, Water pollution treatment, *Wood wastes, Chemical oxygen demand.
Identifiers: *Paper mill wastes, *Wood pulping wastes.

Waste cooking liquor from a pulping process is treated with a hot hydrocarbon liquid to effect rapid coking of water-soluble organic material contained in the waste liquor and drastic reduction in its COD. Five experimental examples are given. (Sinha-OEIS)
W72-13896

CHEMICAL TREATING PROCESS FOR SEWAGE SYSTEMS,
P. T. Dodgson.
U. S. Patent No 3,558,483, 3 p, 1 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 882, No 4, p 1607, January 26, 1971.

Descriptors: *Patents, *Sewage treatment, *Domestic wastes, *Soil contamination, *Emulsifiers, Sulfonates, *Waste water treatment,

Water pollution, Pollution abatement, Separation techniques, Water pollution treatment.
Identifiers: *Chemical treatment, Chlorinated benzene, Sulfonate ethoxylate.

Provides a process for treating the earthen walls of passageways which are employed for dispersing digested sewage into the soil. The sewage disposal system consists of a sewage digestion tank and a cesspool connected to the top of the tank for dispersing the digested sewage for absorption into the soil. Chlorinated benzene is emoulsified with sulfonate ethoxylate to reduce the specific gravity of the benzene. The emulsion is added to the contents of the sewage digestion tank and floated out into the cesspool for dispersing the digested sewage. (Sinha-OEIS)
W72-13899

SEWAGE TREATING APPARATUS AND METHOD,
B. B. Reilly.
U. S. Patent No 3,559,807, 4 p, 6 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 883, No 1, p 166-167, February 2, 1971.

Descriptors: *Patents, *Sewage treatment, Sewage sludge, Waste treatment, Pollution abatement, Separation techniques, *Filtration, *Waste water treatment, Treatment, Equipment.

An aqueous sewage sludge slurry is continuously filtered through a filter unit carried by a travelling foraminous conveyor. The filter, with its deposit, is carried through a heated gaseous downdraft. The dried sludge and the filter unit are removed from the conveyor and disposed of, preferably by passage into a furnace. (Sinha-OEIS)
W72-13900

METHOD AND APPARATUS FOR USE IN THE ACTIVATED SLUDGE TREATMENT OF SEWAGE,
Metropolitan Sanitary District of Greater Chicago, Ill. (assignee).
R. W. Heil.
U. S. Patent No 3,560,376, 4 p, 9 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 883, No 1, p 296, February 2, 1971.

Descriptors: *Patents, *Sewage treatment, Activated sludge, Pollution abatement, *Waste water treatment, Equipment, Treatment, *Microorganisms, *Dissolved oxygen, *Aeration.

This system utilizes a pressure aeration tank for treating a continuous flow of sewage influent. The tank is held at pressures up to 60 psi and aeration is continuous. In the aeration tank there is an intermixing with return-activated sludge (living microorganisms). The microorganisms feed upon the sewage nutrients consuming them by adsorption and absorption. The mixed liquor then passes into a clarifier held at the same pressure as the treatment tank. The flocculate is skimmed off and returned to the sludge line. The clarified effluent liquid is ready for designated discharge. (Sinha-OEIS)
W72-13901

METHOD AND APPARATUS FOR TREATING WATER,
Passavant Werke (Germany) (assignee).
J. Muskat.
U. S. Patent No 3,560,379, 4 p, 6 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 883, No 1, p 297, February 2, 1971.

Descriptors: *Patents, *Water treatment, *Pollution abatement, *Waste water treatment, Water pollution, Equipment, Treatment, Separation techniques, Water pollution treatment, *Aeration.

A narrow elongated aeration tank receives the liquid to be treated. An aeration device is mounted on the bridge and is moved longitudinally as it introduces air into the tank. Lack of motion in one part of the tank allows flocculation to take place. A sludge scraper attached to the bridge moves along with it to scrape the flocculent sludge from the bottom of the tank. (Sinha-OEIS)
W72-13902

EXTENSIONS OF MATHEMATICAL PROGRAMMING FOR REGIONAL WATER QUALITY MANAGEMENT,
California Univ., Los Angeles. Graduate School of Management.
For primary bibliographic entry see Field 05G.
W72-13931

REQUIREMENTS FOR APPROVAL OF INDIVIDUAL SEWAGE DISPOSAL SYSTEMS.
For primary bibliographic entry see Field 05G.
W72-13943

AWARD OF P.L. 660 GRANT FOR CONSTRUCTION OF WASTEWATER TREATMENT FACILITIES AND OUTFALL SEWERS--PROJECT NO. WPC-TEX-722 (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Dallas, Tex. Air and Water Programs Div.

Available from the National Technical Information Service as PB-205 921-D, $3.00 in paper copy. January 21, 1972. 65 p, 5 map, 10 tab, 1 append.

Descriptors: *Texas, *Waste water treatment, *Sewage treatment, *Grants, Sanitary engineering, Sewage effluents, Financing, Water quality control, Stream improvement, Administrative agencies, Water pollution sources, Water pollution control, Interceptor sewers, Sewers, Non-structural alternatives.
Identifiers: *Pittsburg (Tex), *Environmental impact statement.

The proposed action consists of offering grant assistance to the city of Pittsburg, Texas, for the following projects: (1) additions to the existing Sparks Branch wastewater treatment plant, (2) construction of a new wastewater treatment plant on Dry Creek, and (3) construction of interceptor sewers to the proposed Dry Creek wastewater treatment plant. The principal environmental effect of the proposed action will be the immediate improvement in the quality of the Sparks Branch Plant effluent and a reduction in the volume of raw wastes reaching Dry Creek. Unavoidable adverse impacts include land-use restrictions and destruction of certain beneficial organisms from chlorination. The alternatives considered include: construction of a single new treatment plant, construction of a temporary plant on Dry Creek with minimum improvements to the Sparks Branch Plant, and make necessary improvements to Sparks Branch to satisfy the requirements of the Texas Water Quality Board and construct a 2000 PE plant on a site 3/4 miles downstream from the proposed Dry Creek site. The improvements at Sparks Branch will provide immediate improvements to water quality for downstream uses. (Waldron-Florida)
W72-13949

BIOLOGICAL DENITRIFICATION USING FLUIDIZED GRANULAR BEDS,
New York State Dept. of Environmental Conservation, Albany. Environmental Quality Research and Development Unit.
J. S. Jeris, J. A. Mueller, and C. Beer.
Technical Paper Number 11, June 1972. 46 p, 18 fig, 11 tab, 19 ref.

Descriptors: *Sewage treatment, *Denitrification, *Tertiary treatment, *Nutrient removal, *Nitrogen, Nitrates, New York, Municipal wastes, Filter stones, Water pollution control, Activated carbon, Laboratory tests, Waste water treatment.
Identifiers: *Fluidized granular beds, *Biological denitrification.

The concern for controlling water pollution through the removal of nitrogen has included the use of biological techniques. In experiments, 12-foot-long plastic tubes, 3 inches in inside diameter, were filled with activated carbon and granulated sand (effective sizes 0.65 mm and 1.0 mm, respectively) to a height of 9 feet. The influent was pumped in through the bottom of the tubes, fluidizing the beds. The growth of biological organisms was accomplished by seeding. The completed reactor beds removed up to 95 percent of the nitrogen. Flow rates were varied from 8.0 gpm per square foot to 23.5 gpm per square foot, with corresponding detention times varying from 10.5 minutes to 3.5 minutes. Nitrogen removal rates were found to be independent of flow rates, but they were dependent on temperature and the settled height of the column. The major difficulty encountered was the eventual removal of excessive biological growths. Various methods were tried, although none proved successful. It is reported that backwashing with air might be a practical method. The experiments were performed with laboratory test samples. (Poertner)
W72-14047

THE NORTHERN MAINE REGIONAL TREATMENT SYSTEM, AROOSTOOK RIVER--PRESTILE STREAM, A PLAN FOR CLEAN WATER, SUMMARY REPORT.
Northern Maine Regional Planning Commission, Presque Isle.

April 26, 1972. 24 p, 8 fig, 2 tab.

Descriptors: *Maine, *Waste water treatment, *Planning, *Water quality, Municipal wastes, Industrial wastes, Water pollution, Regional analysis, Regional development, Stream pollution, Water pollution control.
Identifiers: *Joint waste water treatment, Regional waste water treatment.

Recognizing the serious pollution problems of the Aroostook River and the Prestile Stream, the Northern Maine Regional Planning Commission undertook this study to develop a regional plan for the area. After identifying the pollution sources as municipal, industrial (primarily food processors, of which the potato is the major crop), and point sources (such as urban and agricultural runnoff), alternate solutions were recommended. It is recommended that industrial and municipal wastes by treated jointly with user charges based on the relative usage of the treatment system. Implementation of the recommendations would result in the completion of treatment plants by 1973 and 1976. (Poertner)
W72-14049

REPORT FOR THE 12 MONTH PERIOD JULY 1, 1970-JUNE 30, 1971,
Rhode Island Dept. of Health, Providence. Div. of Water Supply and Pollution Control.
For primary bibliographic entry see Field 05A.
W72-14051

5E. Ultimate Disposal of Wastes

GEOLOGICAL CONSIDERATIONS OF SANITARY LANDFILL SITE EVALUATIONS,
Geological Survey, Morgantown, W. Va.
For primary bibliographic entry see Field 05B.
W72-13719

EXPERIMENTAL INJECTION OF TERTIARY--TREATED SEWAGE IN A DEEP WELL AT BAY PARK, LONG ISLAND, N. Y.--A SUMMARY OF EARLY RESULTS,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 05B.
W72-13839

THE EVALUATION OF PUBLIC RADIATION EXPOSURE FROM THE CONTROLLED MARINE DISPOSAL OF RADIOACTIVE WASTE (WITH SPECIAL REFERENCE TO THE UNITED KINGDOM),
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 05B.
W72-13977

EXPLORATORY STUDY OF BRINE DISPOSAL USING FLUID-BED EVAPORATION,
Allied Chemical Corp., Idaho Falls, Idaho.
P. E. Lamont.
For sale by Supt. of Documents, U. S. Government Printing Office, Washington, D. C. 20402 for $1.00. Office of Saline Water Research and Development Progress Report No. 743, November 1971. 88 p, 12 fig, 12 tab, 10 ref, 4 append. Agreement No. 14-30-2729.

Descriptors: *Brine disposal, *Brines, *Waste disposal, Desalination, *Evaporation, Evaporators, Solid wastes, Salts, Desalination apparatus.
Identifiers: *Fluid-bed evaporators, Inland plants.

To facilitate brine disposal at inland sites, as well as to protect the environment, it may be necessary to convert the waste brine to solid salts. A new process using fluid-bed evaporation to obtain solid salts is presented. This process differs from ordinary fluid-bed evaporators in that the salt particles are fluidized by superheated steam. The steam is condensed to furnish additional product water. Experimental data from a four inch fluid-bed evaporator is discussed. Cost estimates are given for a 2.5 million gpd vertical tube evaporator or reverse osmosis plant combined with a fluid-bed evaporator. (OSW abstract)
W72-14063

MODEL STUDIES OF OUTFALL SYSTEMS FOR DESALINATION PLANTS (PART II - ESTUARY MODELS),
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 05B.
W72-14064

DISPOSAL OF BRINE BY SOLAR EVAPORATION,
New Mexico State Univ., University Park.
For primary bibliographic entry see Field 02D.
W72-14077

A STUDY OF THE DISPOSAL OF THE EFFLUENT FROM A LARGE DESALINATION PLANT,
Dow Chemical Co., Midland, Mich.
For primary bibliographic entry see Field 05B.
W72-14086

5F. Water Treatment and Quality Alteration

VIRUS AND WATER QUALITY: OCCURRENCE AND CONTROL.

Available from Engineering Publications Office, 112 Engineering Hall, University of Illinois, Urbana 61801, Price: $4.50. Proceedings, Thirteenth Water Quality Conference conducted by University of Illinois and Illinois Environmental Protection Agency Feb 15-16, 1971, Urbana, Illinois (1971). 222 p.

Descriptors: *Water treatment, *Water quality, *Public health, *Diseases, *Viruses, *Coliforms, *Enteric bacteria, *Disinfection, Sanitary engineering.

Thirteen scientific papers pertinent to viruses and water supplies were presented. Topics included water transmission of viruses, detection of viruses in water, concentration of viruses, enteric viruses in ground and surface waters, and virus-sized particle adsorption on soil. Other topics were the coliform test: a criterion for the viral safety of water, removal of virus, the survival of poliovirus in algal-bacterial wastewater treatment plants, effects of some treatment methods, relative resistance of twenty human enteric viruses to free chlorine in the Potamac waters, and the enhancement of viral inactivation by halogen. The speakers agreed that there is insufficient technical data to conclude that virus-free water can be attained with present wastewater and water treatment processes and practices. (See W72-13611 thru W72-13616) (Bean-AWWARF)
W72-13610

ENTERIC VIRUSES IN GROUND AND SURFACE WATERS: A REVIEW OF THEIR OCCURRENCE AND SURVIVAL,
Gulf Coast Water Hygiene Lab., Dauphin Island, Ala.
E. W. Akin, W. H. Benton, and W. F. Hill, Jr.
In: Proceedings, Thirteenth Water Quality Conference, Urbana, Illinois, Feb. 15-16, 1971, p 59-74. 3 fig, 3 tab, 51 ref.

Descriptors: *Water quality, Sanitary engineering, *Public health, *Viruses, *Epidemics, *Groundwater, *Surface waters.

Enteric viruses have been isolated from an average of 36 percent of samples of surface waters collected throughout the world. These viruses are held in the feces of infected man and animals and may enter water systems by way of soil runoff and treated and untreated sewage. The increased frequency of water reuse for domestic purposes has increased the probability of human contact with contaminated surface waters. Viruses tend to adsorb on soil particles and be removed before they reach groundwater, or soon thereafter. However, epidemiological studies have implicated both contaminated surface water and groundwater as the transmission routes in a limited number of infectious hepatitis outbreaks. No widespread waterborne epidemic of viral disease other than infectious hepatitis has been substantiated. The amount of endemic disease caused by contact with virus-contaminated surface waters is unknown. Enteric viruses survive in water for a significant length of time; water should be considered as a potential route of viral disease transmission. Two to 100 days are required for various members of the enteric virus family to lose 99.9 percent of their initial infectivity in different surface waters at 20C to 25C. (See also W72-13610) (Bean-AWWARF)
W72-13611

THE COLIFORM TEST: A CRITERION FOR THE VIRAL SAFETY OF WATER,
Bureau of Water Hygiene, Cincinnati, Ohio.
E. E. Geldreich, and N. A. Clarke.
In: Proceedings, Thirteenth Water Quality Conference, Urbana, Illinois, Feb. 15-16, 1971, p 103-113. 1 fig, 23 ref.

Descriptors: *Water quality, Sanitary engineering, *Public health, *Coliforms, *Viruses, *Standards, *Water treatment.

Much data exist which permit the conclusion that the absence of total coliforms in a treated water is evidence of a bacteriologically safe supply. Insofar as bacterial pathogens are concerned, the coliform group is considered a reliable indicator of the adequacy of treatment. Whether these considerations can be extended to include rickettsial and viral organisms has not been determined. The observation that certain enteric viruses are more resistant to chlorine than are the indicator bacteria has raised questions as to whether drinking water that meets the USPHS drinking water standard is free from disease-producing levels of virus. Also, the susceptibility of enteric viruses to chlorine is unpredictable. Additional studies on the methods of detecting virus in water are needed as well as definitive studies on the coliform level in large volumes of treated water which are coliform free by conventional tests. Epidemiological studies are also needed. Only when these and other investigations are completed will it be possible to state with positive assurance that the coliform test is a reliable test in indicating the biological safety of water. (See also W72-13610) (Bean-AWWARF)
W72-13612

REMOVAL OF VIRUSES FROM WATER AND WASTEWATER,
Environmental Protection Agency, Cincinnati, Ohio. Water Quality Office.
G. Berg.
In: Proceedings, Thirteenth Water Quality Conference, Urbana, Illinois, Feb. 15-16, 1971, p 126-136. 4 fig, 5 tab, 24 ref.

Descriptors: *Water treatment, *Water quality, Sanitary engineering, *Public health, Coliforms, Viruses, *Waste water treatment.

No single method or combination of methods completely recovers all viruses from sewage. Primary settling, which constitutes the whole sewage treatment for most communities, removes little of the viruses from sewage. Several biological treatment methods such as activated sludge, stabilization ponds, and trickling filters may be used for virus removal but with widely varying results. The most efficient and consistently effective of these is activated sludge treatment. Where land is available stabilization ponds often serve secondary treatment needs. Viruses are subjected here not only to the effects of adsorption and the chemical insults that are a part of other treatment processes but also to the destructive effects of sunlight and time. Virus removal is highly variable. Trickling filters pass from 22 to 100 percent of the viruses. As quality of water becomes more important, the costs will become relatively less important, and chemical and physical methods will find increasing application in the treatment of secondary effluents, particularly when total renovation is the goal. Coagulation with alum or ferric chloride removes high percentages of bacteriophages; also coagulation with lime can do the same; activated carbon is less efficient and needs more study. Some cationic polyelectrolytes removed over 99 percent of the viruses, though when used with the usual coagulants they did not increase the percentage of removal. (See also W72-13610) (Bean-AWWARF)
W72-13613

VIRUSES IN WATER AND WASTEWATER: EFFECTS OF SOME TREATMENT METHODS,
Wisconsin Univ., Madison. Dept. of Bacteriology.
D. O. Cliver.
In: Proceedings, Thirteenth Water Quality Conference, Urbana, Illinois, Feb. 15-16, 1971, p 149-159. 3 fig, 3 tab, 12 ref.

Descriptors: *Water treatment, *Water quality, Sanitary engineering, *Public health, *Viruses, Activated carbon, Polyelectrolytes.

Enteroviruses, some of which had been labeled with radioactive phosphorus were added to samples of water and wastewater. A polycation prima-

ry coagulant did not remove significant quantities of virus from these samples. Virus was removed by activated carbon treatment, but a good deal was still present in the effluents from the carbon columns. The use of radioactive tracer proved quite helpful in some of these experiments. It might well be very valuable in future studies of methods for removal of viruses as physical particles. (See also W72-13610) (Bean-AWWARF)
W72-13614

RECENT RESEARCH RESULTS ON VIRUS INACTIVATION BY WATER TREATMENT PROCESSES,
Maine Univ., Orono.
O. J. Sproul.
In: Proceedings, Thirteenth Water Quality Conference, Urbana, Illinois, Feb. 15-16, 1971, p 159-169. 5 tab, 24 ref.

Descriptors: *Water treatment, *Public health, Sanitary engineering, *Viruses, Adsorption, Coagulation, Chlorination, Diatomaceous earth, Filtration, Ozonation, Hydrogen ion concentration.

Research data collected within the past five years on virus inactivation by water treatment processes are reviewed. The processes examined are water softening and alkaline pH conditions, coagulation, filtration, and adsorption. Research efforts presently under way are examined to indicate what research results will be forthcoming within the next several years. Present known worldwide research in virus inactivation by water treatment is listed on these processes (some projects cover more than one process): Adsorption (2), Coagulation (3), Chlorination (2), Diatomaceous earth (1), Filtration (2), Ozonation (2), and pH (1). Nine projects are in the U.S., one each is in England, France, Israel, and South Africa. (See also W72-13610) (Bean-AWWARF)
W72-13615

RELATIVE RESISTANCE OF TWENTY HUMAN ENTERIC VIRUSES TO FREE CHLORINE IN POTOMAC WATER,
Northeastern Water Hygiene Lab., Narragansett, R.I.
O. C. Liu, H. R. Seraichekas, E. W. Akin, D. A. Brashear, and E. L. Katz.
In: Proceedings, Thirteenth Water Quality Conference, Urbana, Illinois, Feb. 15-16, 1971, p 171-195. 4 fig, 24 tab, 19 ref.

Descriptors: *Water quality, *Water treatment, Sanitary engineering, *Public health, *Viruses, Coliforms, Chlorination.

Twenty strains of human enteric viruses were tested for chlorine resistance when suspended in Potamac estuarine water partially purified by conventional water treatment processes. These included three types of poliovirus, five coxsackieviruses, six echoviruses, three adenoviruses, and three reoviruses. A wide range of resistance was observed among the viruses tested. The least resistant virus was a reovirus requiring 2.7 min for a 99.9 percent devitalization by 0.5 mg/l of free chlorine and the most resistant virus was a poliovirus requiring 40 min for the same percent devitalization. The findings are in general agreement with those reported in the literature. These results indicate that the degree of chlorine resistance in any given virus is unpredictable. Among those tested, several viruses showed an obvious retardation of the initial inactivation rate in the later portion of the inactivation curve. Theoretically, this could be explained by the presence of viral aggregates. Although the number of aggregates in each preparation was very small, 0.1 percent or less, the increase in resistance to chlorine and time for inactivation was considerable. (See also W72-13610) (Bean-AWWARF)
W72-13616

MACRORETICULAR RESINS-A SOLUTION TO AGGRESSIVE CONDITIONS,
For primary bibliographic entry see Field 05D.
W72-13690

EVALUATION OF THE HYPOIODOUS IODINE TABLET - PHASE II,
Naval Medical Field Research Lab., Camp Lejeune, N.C.
N.S. Hurst, and E. L. Gitin.
Avaiable from the National Technical Information Service as AD-741 256, $3.00 in paper copy, $0.95 in microfiche. Naval Medical Field Research Laboratory, Vol 22, No. 9, May 1972. 4 p., 2 tab, 6 ref.

Descriptors: *Disinfection, *Potable water, Solubility, Humidity, Bactericides, *Water treatment.
Identifiers: *Hypoiodous acid tablets, Storage conditions, Disinfecting agent, Amoebicidal potency.

The results of a study on the feasibility of utilizing hypoiodous acid (Hol) tablets as an agent for microbial decontamination of water were presented. Characteristics which were evaluated included: disinfectant capabilities, solubility, and the influence of storage on these parameters. Hol tablets were stored for one year at 4 deg. C, ambient conditions, and 29 deg. C with a relative humidity of 85%. Storage conditions adversely influence the iodine content, coloration, and solubility of the Hol tablet. Fresh tablets or those stored at 4 deg. C maintained high bactericidal and amoebicidal potency. It was recommended that Hol tablets should not be adopted as the standard disinfecting agent for water used by the U. S. Marine Corps. (Galwardi-Texas)
W72-13701

VIRUS INACTIVATION BY WATER TREATMENT,
Maine Univ., Orono. Dept. of Civil Engineering.
O. J. Sproul.
Journal of he American Water Works Association, Vol 64, No 1, p 31-35, January 1972. 5 tab, 24 ref.

Descriptors: *Water treatment, *Data collections, *Water supply, *Viruses, Investigations, Filtration, Water softening, Alkalinity, Coagulation, Absorption, Research and development.
Identifiers: *Virus inactivation, *Research literature, Virus-removal capacity.

Data within the last five years which deal with virus inactivation by water-treatment processes are reviewed. The processes examined are: water softening, alkaline pH conditions, coagulation, filtration, and absorption. This survey of recent research literature demonstrates that nearly all water-treatment processes in present use are under research investigation in order to define their virus-removal capacity. If the virus problem in water supplies is really as severe as recent scientific and popular literature indicates, then the research needs and research efforts in this field are totally uncorrelated. No research effort in the past ten years has been concerned with virus removal by filtration. Over the same period, this process has become the only treatment unit in some plants, performing the roles of flocculation chamber, sedimentation tank and filter. (Strachan-Chicago)
W72-13741

RESPONSIBILITY FOR PLANT OPERATIONS,
Maryland State Dept. of Health and Mental Hygiene, Baltimore.
W. M. Bingley.
Journal of the American Water Works Association, Vol 64, No 3, p 132-135, March 1972. 1 photo, 10 ref.

Descriptors: *Operations, *Planning, *Decision making, *Coordination, *Water supply, Contract administration, Management, *Treatment facilities.
Identifiers: *Water treatment plant operations, *Cooperation, Ownership.

The responsibility for provision of a safe water supply is discussed. Effective treatment is the result of coordinated and cooperative efforts of the persons that control the operations. The levels of responsibility are outlined. (1) The owner guards the raw-water supply, by hiring competent personnel to operate his plant. (2) The consulting engineer plans the treatment facility with strict attention to the economics of the situation. (3) The contractor constructs the plant in accordance with the engineer's plans and specifications. (4) The equipment supplier instructs the operator in the proper manner in which each unit should be used. (5) The operator has primary responsibility, and he provides routine lubrication, maintenance, and conducts laboratory tests. (6) The regulatory agency reviews reports and plans concerning treatment facilities to insure that local regulations are followed. Frequently, these levels of responsibility are not clearly outlined. (Strachan-Chicago)
W72-13742

METHOD AND MEANS FOR DETECTING COLIFORM BACTERIA IN WATER,
Hach Chemical Co., Ames, Iowa. (Assignee)
For primary bibliographic entry see Field 05A.
W72-13881

ION EXCHANGE APPARATUS FOR TREATING LIQUIDS,
Maschinenfabrik Augsburg-Nuernberg A.G., Essen (West Germany).
For primary bibliographic entry see Field 03A.
W72-13885

PROCESS FOR TREATING WATER WITH A POLYHALIDE RESIN USING A SEMIPERMEABLE MEMBRANE BARRIER,
Dow Chemical Co., Midland, Mich. (Assignee).
J. Place, and R. D. Goodenough.
U. S. Patent No 3,554,905, 2 p, 2 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 882, No 2, p 772, January 12, 1971.

Descriptors: *Patents, *Water treatment, Resins, *Membranes, *Semipermeable membranes, *Microorganisms, *Anion exchange, *Halogens.
Identifiers: Polyhalide, Polybromide.

A semipermeable membrane is interposed between the liquid and a water-wet polyhalide resin having a higher equilibrium concentration of halogen or interhalogen than the liquid to be treated. The membrane reduces the polyhalide resin instability arising from the influence of water-soluble anions and alkalinity in the water supply. (Sinha-OEIS)
W72-13887

METHOD AND APPARATUS FOR TREATING WATER,
Passavant Werke (Germany) (assignee).
For primary bibliographic entry see Field 05D.
W72-13902

POTABLE WATERS.
For primary bibliographic entry see Field 05G.
W72-13940

REPORT FOR THE 12 MONTH PERIOD JULY 1, 1970-JUNE 30, 1971,
Rhode Island Dept. of Health, Providence. Div. of Water Supply and Pollution Control.
For primary bibliographic entry see Field 05A.
W72-14051

THE REMOVAL OF COXSACKIE VIRUS FROM WATER BY SAND OBTAINED FROM THE RAPID SAND FILTERS OF WATER--PLANTS,
I. Nestor, and L. Costin.
J Hyg Epidemiol Microbiol Immunol (Prague). 15 (2): 129-136, 1971, French, German and Spanish summary.
Identifiers: Amberlite, *Coxsackie virus, Saccharomyces-Cerevisiae, *Sand filters, Waterworks, Water treatment, Filtration.

The capacity of fresh filtering sand and of sand used in operating filters in a water plant to remove Coxsackie virus was investigated. Fresh, dry sand has less removal capacity than does moistened sand. The highest virus removal was obtained with sand samples collected from the functioning filters, both experimentally and in field studies. In these samples, 3 virus strains were detected. Two more strains were isolated from filtered and chlorinated H2O. The concentration method of using Saccharomyces cerevisiae give much better results than the Amberlite-IR 45 method.--Copyright 1972, Biological Abstracts, Inc.
W72-14156

HYGIENIC STANDARDIZATION OF PHENOL IN WATER BODIES (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
Y. I. Kostovetskii, and Z. I. Zholdakova.
Gig Sanit, 36 (7): 7-10, 1971, English summary.
Identifiers: Algae, *Chlorination, Hygienic standards, *Phenol, Water treatment, *Water quality standards, Odor.

A differential standardization of phenol in water bodies is suggested. Besides the previously determined hygienic standard of 0.001 mg/l, based on the specific smell imparted by phenol to H2O during its chlorination, phenol at concentrations within 1 mg/l may be considered permissible when drinking water treatment processes do not include chlorination. These standards can also be applied to surface water containing large amounts of algae, as the phenols formed in these waters do not produce a chlorphenol smell.--Copyright 1972, Biological Abstracts, Inc.
W72-14157

5G. Water Quality Control

VIRUS AND WATER QUALITY: OCCURRENCE AND CONTROL.
For primary bibliographic entry see Field 05F.
W72-13610

ENTERIC VIRUSES IN GROUND AND SURFACE WATERS: A REVIEW OF THEIR OCCURRENCE AND SURVIVAL,
Gulf Coast Water Hygiene Lab., Dauphin Island, Ala.
For primary bibliographic entry see Field 05F.
W72-13611

THE COLIFORM TEST: A CRITERION FOR THE VIRAL SAFETY OF WATER,
Bureau of Water Hygiene, Cincinnati, Ohio.
For primary bibliographic entry see Field 05F.
W72-13612

REMOVAL OF VIRUSES FROM WATER AND WASTEWATER,
Environmental Protection Agency, Cincinnati, Ohio. Water Quality Office.
For primary bibliographic entry see Field 05F.
W72-13613

OZONATION REACTIONS OF SELECTED PESTICIDES FOR WATER POLLUTION ABATEMENT,
Washington State Univ., Pullman.
G. R. Brower.
Available from University Microfilms, Ann Arbor, Michigan, Order No. 67-9384, Microfilm, $3.00, Xerox $9.70. Ph. D. Dissertation, 1967, 211 p.

Descriptors: *Aldrin, *Chemical degradation, *Ozone, *Oxidation, Analytical techniques, Tracers, Radioactivity techniques, Chromatography, Toxicity, Laboratory tests, Laboratory equipment, *Pollution abatement.
Identifiers: Bluegill fingerlings, Carbon-14, Labelling, Physical stripping.

Saturated solutions of the pesticide aldrin were chemically oxidized by ozone. The results of gas chromatographic analyses showed that 95% of the aldrin was degraded to other compounds within five minutes. Aldrin was soluble in the fat solvents n-hexane and benzene. A technique was developed to study the oxidation products of aldrin in water at a concentration in the parts per billion range. Instrumentation and methodology including infrared spectroscopy, thin-layer chromatography, radioactive tracer techniques, purification procedures, volatility studies, column chromatography, wet chemical methods and physiological tests were used to further study the degradation products. A carbon- 14 labelled sample of aldrin showed that no physical stripping occurred through the ozonation procedure. The physiological tests indicated that a staurated solution of aldrin dissolved in a water supply can be rendered less toxic by ozonation. The ozonated products of aldrin oxidation were less toxic than aldrin to bluegill fingerlings. (Galwardi-Texas)
W72-13685

A PROBABILISTIC ANALYSIS OF DISSOLVED OXYGEN-BIOCHEMICAL OXYGEN DEMAND RELATIONSHIP IN STREAMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W72-13688

INVESTIGATION OF SINKING METHODS FOR REMOVAL OF OIL POLLUTION FROM WATER SURFACES. PHASE II. METHODS OF TEST FOR LABORATORY EVALUATION OF OIL SINKING MATERIALS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
E. C. Roshore.
Available from the National Technical Information Service as AD-741 247, $3.00 in paper copy, $0.95 in microfiche. Coast Guard Office of Research and Development, February 1972. 59 p., 22 fig, 1 tab.

Descriptors: *Oil wastes, Oily water, *Pollution abatement, *Laboratory tests, Efficiencies, Performance, *Oil pollution, Water pollution control, Separation techniques, Water treatment (Pollution).
Identifiers: *Oil spills, Oil sinking materials, Talcs, Chalks, Asbestos, Sinking efficiency.

Laboratory tests were developed to evaluate the effectiveness of oil sinking materials under varying conditions. Tests were developed to determine: optimum oil sinking material retention potential, sinking efficiency, dynamic retention capability, and volatile loss-time characteristics of oil retained on glass wool. The tests developed were not applicable to Bunker C fuel oil due to its semisolid state at laboratory conditions. No significant difference was noted in results obtained due to water composition-fresh water or simulated sea water. Tables were presented evaluating the reproducibility of tests. Screening tests indicated that very fine materials such as talcs, and materials such as chalks and asbestos do not act as effective sinking agents without addition of surfactants which were not included. (Galwardi-Texas)
W72-13702

ENVIRONMENTAL GEOLOGY AND HYDROLOGY, TALLAHASSEE AREA, FLORIDA.
Florida Dept. of Natural Resources, Tallahassee. Bureau of Geology.
For primary bibliographic entry see Field 06D.
W72-13740

EFFECTS OF LAND USE ON MUNICIPAL WATERSHEDS,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 04C.
W72-13759

COMPLEXATION OF METAL IONS WITH NATURAL POLYELECTROLYTES (REMOVAL AND RECOVERY OF METAL IONS FROM POLLUTED WATERS),
Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W72-13776

OIL POLLUTION CONTROL AND FIRE EXTINGUISHING APPARATUS AND METHOD,
S. M. Verdin.
U. S. Patent No 3,554,290, 3 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 882, No 2, P 633, January 12, 1971.

Descriptors: *Patents, *Pollution abatement, *Oil pollution, Leakage, Sea water, Water pollution control, Water pollution treatment, Equipment, Treatment, *Oil wells.
Identifiers: Fire, *Oil fires.

This invention provides a special hoodlike structure which can be lowered over a well site. The interior of the hood faces downward and has a concave deflecting surface. The oil is directed into a catch basin in the hood. The collected oil is pumped to a storage structure. (Sinha-OEIS)
W72-13884

EXTRACTING OIL WASTE,
For primary bibliographic entry see Field 05D.
W72-13888

FLUID SEPARATION,
Phillips Petroleum Co., Bartlesville, Okla. (Assignee).
F. A. Harrington.
U. S. Patent No. 3,556,297, 3 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 882, No 3, p 1106, January 19, 1971.

Descriptors: *Patents, Separation techniques, Oil wastes, *Oil pollution, Oily water, Pollution abatement, *Liquid wastes, *Waste water treatment, *Industrial wastes, Water pollution control, Water pollution treatment.
Identifiers: *Gas injection.

Immiscible liquids are separated by injecting an insoluble gas beneath the surface of the liquids to create a zone of lower density and causing this zone to move across the surface and to move the superimposed liquid with it toward a point from which the superimposed liquid is removed. (Sinha-OEIS)
W72-13890

FLOATING FLEXIBLE SKIMMING DEVICES,
M. F. Smith.

U. S. Patent No 3,556,301, 5 p, 10 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 882, No 3, p 1107, January 19, 1971.

Descriptors: *Patents, Oil pollution, Equipment, Pollution abatement, Separation techniques, *Oil spills, Water pollution control, Water pollution treatment, *Flotsam, *Industrial wastes.
Identifiers: *Oil skimmers.

This skimming device consists of two flexible sheets for an elongate intake portal positioned at or slightly below the surface of the water. Negative pressure is created at the portal by a flexible conduit supported along the surface of the water. The conduit is connected to a diaphragm vacuum pump or other negative pressure source. Oil or other flotsam is drawn between the two flexible sheets through the conduit into a storage vessel. (Sinha-OEIS)
W72-13891

OIL SKIMMING APPARATUS,
Ocean Pollution Control, Inc., Dallas, Tex. (assignee).
H. J. Fitzgerald, and E. H. Koepf.
U. S. Patent No 3,557,960, 3 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 882, No 4, p 1492, January 26, 1971.

Descriptors: *Patents, *Oil pollution, *Oil spills, Equipment, Separation techniques, Pollution abatement, Water pollution control, Water pollution treatment.
Identifiers: *Oil skimmers.

The skimming device consists of a pair of lateral coextensive funnels positioned one behind the other along the same central axis and a harness to connect the funnels to a towing vessel. The funnels have a cover of flexible sheet material impervious and impermeable to oil. Skirts are arranged to trap the oil and channel it inward toward the apex. A sump trailing behind the apex receives the oil and a flexible conduit directs the oil to a storage vessel. (Sinha-OEIS)
W72-13894

OIL POLLUTION OF THE MARINE ENVIRONMENT - A LEGAL BIBLIOGRAPHY,
University of Southern California, Los Angeles.
C. Q. Christal.
Committee on Public Works, United States Senate, Washington, D.C., Serial No 92-1, January 1971. 102 p, 1,055 ref. U.S. D. of C., S.G.P. (GH-89).

Descriptors: *Bibliographies, *Legal review, *Water law, *Water pollution, *Oil pollution, Jurisdiction, Damages.
Identifiers: *International rights, *National rights, *States rights, *Public rights, *Private rights, Territorial waters, High seas, Deep sea bed, Continental shelves.

A wide-ranging legal bibliography touching on the functions of nation-states, international organizations both public and private, and the role of the legal practitioner in relation to oil pollution of the marine environment has been compiled. Legal rights and duties are emphasized, however, enough data on scientific and economic problems has been defined so that matters of jurisdiction, proof of facts, damages, and judgments would be available to counsel engaged in litigation. The bibliography identifies current developments concerning national rights in territorial waters, continental shelves, the high seas, and deep sea-bed and ocean floor areas beyond the limits of national jurisdiction. The many decisions of Federal and State courts were not collected for this bibliography as these may be found in the 'United States Code Annotated' and the 'Environment Reporter.' (Ensign-PAI)
W72-13904

A FRAMEWORK FOR IDENTIFICATION AND CONTROL OF RESOURCE DEGRADATION AND CONFLICT IN THE MULTIPLE USE OF THE COASTAL ZONE,
California Univ., Berkeley. Dept. of Landscape Architecture.
J. C. Sorensen.
Masters Thesis, June 1971. 71 p, 5 fig, 130 ref.

Descriptors: *California, *Coasts, *Resources, *Deterioration, *Resource development, Planning, Future planning (Projected), Water resources planning, Multiple-purpose projects.

Identification and control of conflict among competing uses for coastal resources and the accompanying deterioration of the resource base of the coastal zone are discussed. Development of an impact system framework is described and applications of the framework both as seen and foreseen are outlined. Future tasks for the improvement of the procedure are suggested. (Ensign-PAI)
W72-13906

STUDY OF ENVIRONMENTAL IMPACTS OF ALTERNATIVE LONG ISLAND SOUND BRIDGE SITES,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 06G.
W72-13907

FISH AND WILDLIFE IN THE MARINE AND COASTAL ZONE, PART A, SUMMARY PLANNING INFORMATION, AND RECOMMENDATIONS,
California State Dept. of Fish and Game, Sacramento.
For primary bibliographic entry see Field 06G.
W72-13908

SULFURIC ACID: ITS POTENTIAL FOR IMPROVING IRRIGATION WATER QUALITY,
Arizona Univ., Tucson. Dept. of Agricultural Chemistry and Soils.
H. L. Bohn, and R. L. Westerman.
In: Hydrology and Water Resources in Arizona and the Southwest, Proceedings, Arizona Section-American Water Resources Association, and the Hydrology Section-Arizona Academy of Science, April 22-23, Tempe, Vol 1, p 43-52, 1971. 1 tab, 6 ref. Rockefeller Foundation Grant 70073.

Descriptors: *Alkaline soils, *Air pollution, *Sulfur compounds, *Irrigation water, *Arid lands, Southwest U.S., Colorado River, Groundwater, Economic feasibility, Arizona, Sodium, Bicarbonates, Carbonates, Sulfur, Calcium, Soil chemical properties, Water quality, Ion exchange.
Identifiers: *Sulfuric acid, *Sulfur dioxide.

The 2 major environmental problems of Arizona and the Southwest are the alkalinization of soil and water by irrigation and air pollution from copper smelting. It is proposed that the amelioration of both problems may be solved through a common process. This is the production of sulfuric acid from sulfur dioxide, which is the main pollutant of smelter effluent gases. The conversion process is cheap and easy, and the sulfuric acid could then be added to irrigation waters to increase the solubility of Ca carbonate in the soil, thereby decreasing alkalinity. Lower alkalinity results in increased soil permeability and increased water use efficiency by plants. The potential market for sulfuric acid in irrigation was calculated, on the basis of neutralizing 90% of the bicarbonate ion concentration in Colorado River water and Arizona well water, to be about 1.6 million tons annually, representing about 1/3 of the sulfur now dissipated by smelters as air pollution. This market includes both the Imperial Valley of California and the Mexicali Valley of Mexico, both of which are currently experiencing mounting salinity problems. Salinity itself is not amenable to this treatment, but the cumulative increase in Na and bicarbonate may be slowed and reversed, leading to gradual soil stabilization. (Casey-Arizona)
W72-13920

EXTENSIONS OF MATHEMATICAL PROGRAMMING FOR REGIONAL WATER QUALITY MANAGEMENT,
California Univ., Los Angeles. Graduate School of Management.
G. Graves.
Copy available from GPO Sup Doc for $1.00; microfiche from NTIS as PB-212 008, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, April 1972. 82 p, 10 fig, 7 tab, 15 ref. EPA Program 16110 EGQ 04/72.

Descriptors: *Water quality control, *Regional analysis, *Optimum development plans, *Water pollution treatment, Computer models, Model studies, Networks, Systems analysis.
Identifiers: *Nonlinear programming.

The objective is to develop a general practical planning tool to provide optimal solutions for the complex choices involved in balancing alternative methods for attaining water quality goals. Extended is the earlier work, 'Mathematical Programming for Regional Water Quality Management.' A mixed integer, continuous variable nonlinear programming model is developed which promises to be much more realistic and effective in selecting an optimal configuration of regional treatment plants and pipe juncture nodes. A new Bender's type decomposition for the non-linear model is also presented as an appropriate and feasible solution technique. In the area of the physical response of the environment the earlier work linked the dissolved oxygen profile and the control options through a constant transfer matrix obtained as a steady state solution to a system of differential equations. This work shows how the transfer coefficients can be recalculated periodically in the course of the system optimization. Full scale computations are carried out demonstrating this capability. The theoretical framework for including two additional treatment methods, mechanical re-aeration and flow augmentation via reservoirs is also developed. (See also W72-01659) (Bell-Cornell)
W72-13931

A MULTILEVEL APPROACH TO DETERMINING OPTIMAL TAXATION FOR THE ABATEMENT OF WATER POLLUTION,
Case Western Reserve Univ., Cleveland, Ohio. Systems Engineering Div.
Y. Y. Haimes, M. A. Kaplan, and M. A. Husar, Jr.
Water Resources Research, Vol 8, No 4, p 851-860, August 1972. 3 fig, 4 tab, 16 ref.

Descriptors: *Water quality control, *Pollution abatement, *Pollution taxes (Charges), *River basins, Optimization, Waste water treatment, Costs, Digital computers, Simulation analysis, Biochemical oxygen demand, Mathematical models, Systems analysis, Dissolved oxygen.
Identifiers: *Regional water quality management, *Miami River basin, Cost functions, Plant capacity, Treatment level, Polluters.

A three-level optimization approach is developed for regional water quality management. The problem of simultaneously finding an optimal waste water treatment configuration for meeting water quality standards along a river basin and determining optimal effluent charges to achieve this configuration is solved by decomposition and the multilevel approach. The optimal regional plant capacity and the regional treatment level are also found, depending on which polluters decide to use the regional facilities. (1) The individual polluters, (2) the regional treatment plant, and (3) the central authority are the three levels of optimization that are introduced for solution of the regional

problem. It is assumed that the central authority does not need to know the local cost functions. Numerical results from simulated use of the technique with data for the Miami River basin reveal the efficiency and the effectiveness of the multilevel, hierarchical approach in the modeling, control, and management of regional water quality problems. Considerable savings over local treatment alone can be realized by employing regional treatment facilities. (Bell-Cornell)
W72-13935

PRIVATE REMEDIES TO ABATE WATER POLLUTION IN VIRGINIA AND NEW THEORIES IN ENVIRONMENTAL LAW,
L. J. Roos.
William and Mary Law Review, Vol 13, p 477-518 (1971). 42 p, 267 ref.

Descriptors: *Virginia, *Legal review, *Water pollution, *Riparian rights, Legal aspects, Judicial decisions, Navigable waters, Constitutional law, Reasonable use, Natural use, Natural flow doctrine, Artificial use, Competing uses, Percolating water, Underground streams, Subsurface waters, Surface-groundwater relationships, Tidal waters, Lakes, Common law.
Identifiers: *Nuisance (Legal aspects), *Damages (Legal aspects), *Public trust doctrine.

Common law theories of water rights are discussed as they relate to water pollution abatement in Virginia. Virginia case law incorporates both the natural use and reasonable use theories of riparian rights, although the latter is more generally preferred. Rights pertaining to percolating groundwater and underground watercourses are distinguished. The absolute ownership doctrine of underground waters is criticized as preventing suits for pollution of such waters. The substantive law relating to the following is discussed: diffused surface water; tidal waters; natural lakes, ponds, and springs; navigable waterbodies; interference with land; and public nuisance. The author explains some of the problems of proof involved in common law pollution abatement actions such as balancing the equities, proximate cause, and the burden of apportionment among contributing polluters. Common law defenses are also explained. The public trust doctrine, its application to water pollution, and a potential constitutional right to a clean environment are analyzed. Finally the author explains some of the procedural aspects of environmental litigation such as standing to sue, qui tam actions, and class actions. The author concludes that the reasonable use rule should be universally followed and that rules of joinder should be liberalized for contributing polluters. (Grant-Florida)
W72-13937

THE LAW AND THE CORPORATE POLLUTER: FLEXIBILITY AND ADAPTION IN THE DEVELOPING LAW OF THE ENVIRONMENT,
H. S. Laughran.
Mercer Law Review, Vol 23, No 2, p 571-601 (1972). 31 p, 207 ref.

Descriptors: *Institutions, *Water quality control, *Legal aspects, *Common law, Law enforcement, Economic justification, Political aspects, Legal review, Water quality standards, Water management (Applied), Water resources development, Water law, Water pollution control, Institutional constraints, Political constraints, Social aspects, Social adjustment, Social impact, Environmental effects, Economic impact, Social values.
Identifiers: *Corporate pollution, *Quo warranto.

The author describes the nature of the environmental problems--particularly pollution--in the economic, cultural, and political contexts, and he discusses how the legal system came to be concerned with these problems. The author concludes that the problem should be viewed in the common law tradition and familiar legal theories may be necessary, at least during the period of adjustment and pending the development of workable new approaches. The author deals specifically with the problem of the corporate polluter and some of the ways in which the legal system has approached and attempted to deal with that problem. Finally the author considers two new, and as yet untested, applications of established legal doctrine which might be brought to bear on the corporate pollution problem. These approaches, quo warranto and shareholder derivative actions, are new only in their possible applicability to environmental problems and contribution to environmental law. The author concludes that everyone is responsible for pollution, but that business corporations are able to control pollution, however uneconomic this may be, and that corporations must be forced to obey the law. (Widman-Florida)
W72-13938

POTABLE WATERS.

Hearing on Amendment 410 to S.1478--Comm. on Commerce, U.S. Senate, 92d Cong, 2nd Sess, March 20, 1972. 214 p.

Descriptors: *Water purification, *Potable water, *Water quality standards, *Legislation, Water pollution effects, Water pollution treatment, Research and development, Environment, Environmental effects, Pollutants, Quality control, Government finance, Local government, Natural use, Sewage bacteria, Viruses, Political aspects, Water pollution control, Legal aspects, Law enforcement, Federal government, Grants, Water supply.
Identifiers: *Environmental Protection Agency.

Proposed amendment 410 to S.1478 would establish within the Environmental Protection Agency a Water Hygiene Advisory Council and an Office of Water Hygiene, the purpose of which would be to publish national standards to insure that adequate quantities of safe and aesthetic water for drinking and other human uses are provided to the public. The statements of 13 witnesses generally approved of the amendment's provisions and its nationwide applicability. The Environmental Protection Agency stressed the immediate need for such provisions, but emphasized that primary enforcement responsibility shall remain at the local level. Opposition was expressed to the provisions making available planning and improvement grants for state water hygiene programs as not being necessary or desirable and to the establishment of a Water Hygiene Advisory Council and as limiting needed administrative flexibility. It was also the Agency's opinion that certain provisions were duplicative of the Federal Water Pollution Control Act and should be omitted. Ralph Nader stressed the need for stronger enforcement procedures including adequate public notice of failure to meet the standards and the need to allow citizens the right to institute legal actions against those in noncompliance. Opinions preferring the inclusion of an explicit timetable for the revision of the drinking water standards were expressed. Also included is a discussion of the contaminants found in drinking water and the need for the imposition of nationwide standards. (Ellis-Florida)
W72-13940

PROPOSED RECLASSIFICATIONS OF CERTAIN WATERS IN THE BROAD, CATAWBA, FRENCH BROAD, HIWASSEE, LITTLE TENNESSEE, NEW, AND WATAUGA RIVER BASINS TO BE CONSIDERED AT A PUBLIC HEARING TO BE HELD ON JUNE 29, 1972, IN HICKORY, NORTH CAROLINA.
North Carolina Board of Water and Air Resources, Raleigh.
Water and Air Quality Control Committee, North Carolina Board of Water and Air Resources, (1972). 64 p, 7 tab.

Descriptors: *North Carolina, *River basins, *Classification, *Water resources, Water pollution, Water management (Applied), Water quality, Water quality control, Standards, Regulation, Administrative agencies, Fishing, Recreation, Water supply, Water utilization, Adoption of practices, Boating, Industrial water, Agriculture.

Proposed classifications of certain waters in the state of North Carolina is made by the Water and Air Quality Control Committee of the North Carolina Board of Water and Air Resources. The following waters are included in the classification: Hiwassee River Basin, Little Tennessee River Basin, French Broad River Basin, Broad River Basin, New River Basin, Watauga River Basin, and the Catawba River Basin. The classification process has been undertaken in consideration of requests for classifications by other agencies. All evaluations have been carefully made in accordance with the quality of the waters and the best usage of the waters in the public interest. The classifications which have been assigned include the following: suitable as a source of drinking water; suitable as a source of drinking water after treatment; suitable for outdoor bathing; suitable for fish and wildlife propagation, boating and wading; and suitable for agriculture, industrial process water supply, fish survival, and navigation. (Grant-Florida)
W72-13942

REQUIREMENTS FOR APPROVAL OF INDIVIDUAL SEWAGE DISPOSAL SYSTEMS.
New Mexico Environmental Improvement Agency, June 27, 1972. 2 p.

Descriptors: *New Mexico, *Sewage disposal, *Septic tanks, *Water quality standards, Water pollution sources, Sewage treatment, Regulation, Administrative agencies, Environmental sanitation, Waste water (Pollution), Public health, Environmental engineering, Soil contamination, Groundwater recharge, Groundwater movement, Aquifer characteristics, Sewage effluent.
Identifiers: *Individual sewage disposal systems.

The authority of the New Mexico Environmental Improvement Agency to regulate individual sewage disposal systems extends to all such systems to be constructed within the state. Sewage disposal systems will not be permitted where they constitute a potential public health hazard or nuisance condition. Information which is required from the applicant prior to approval of a sewage system includes: suitability of the soil for effluent percolation; depth to and characteristics of the bedrock; slope of the ground surface; depth, rate, and direction of groundwater flow; flooding potential; type of system used; density of treatment systems in the area; and type and density of vegetation. Minimal conditions for approval of sewage system installation are defined in relation to the proximity of the sewage system from a source of community water supply. Minimal conditions for septic tank installation in proximity to a private water supply are also explained. The listed criteria are not applicable to waste water facilities which will discharge more than 1000 gallons per day or which will be unable to meet selected minimal requirements. Effluent must be certified to conform to Water Quality Control Commission Regulations in these situations. (Grant-Florida)
W72-13943

ANALYSIS--FLORIDA WATER RESOURCES ACT OF 1972, (CHAPTER 72-299, LAWS OF FLORIDA).
For primary bibliographic entry see Field 06E.
W72-13944

NATURAL RESOURCES AND RECREATION AGENCIES, 1971 ANNUAL REPORT.
For primary bibliographic entry see Field 06E.
W72-13945

SIGNING OF GREAT LAKES WATER QUALITY AGREEMENT, APRIL 15.

Dept. of State Bulletin, Vol LXVI, No 1715, p 652-657, May 8, 1972. 6 p.

Descriptors: *Great Lakes, *International Joint Commission, *Water quality control, *Pollution abatement, Eutrophication, Oil pollution, Sludge, Waste treatment, Industrial wastes, Phosphates, Phosphorus, Ships, Agriculture, Thermal pollution, Environment, Environmental effects, Government finance, Political aspects, Environmental control, Water pollution control, Water pollution treatment, Legal aspects, Legal review, Water pollution sources.
Identifiers: *Great Lake Water Quality Agreement, *Boundary Waters Treaty.

The Agreement includes specific measures to more effectively implement the 1909 Boundary Waters Treaty between the United States and Canada. The Agreement marks the first major effort by two nations to jointly solve a serious environmental problem affecting a shared resource. General water quality objectives to be reached by both the United States and Canada are described in terms of freedom from the following: toxic substances; accelerated eutrophication; oil and other floating materials; materials producing odor, color, or other nuisance conditions; and sludge deposits. The parties agree to provide for the construction of waste treatment facilities providing levels of treatment consistent with specific water quality objectives. Similar provisions for the control of pollution from industrial, agricultural, and shipping sources are included. Measures to reduce the input of nutrients into the lakes to stem the complex and massive problem of eutrophication are also included. Other measures emphasize a reduction in the amount of phosphates flowing into the lakes, the prevention of discharges of oil and other hazardous polluting substances, and requirements controlling thermal discharges. The International Joint Commission is charged with the responsibility of assisting the parties in implementing the commitments. The brief statements of Prime Minister Trudeau and President Nixon are included. (Ellis-Florida)
W72-13947

POWERS AND DUTIES OF THE DEPARTMENT OF ENVIRONMENTAL RESOURCES, ITS OFFICERS AND DEPARTMENTAL AND ADVISORY BOARDS AND COMMISSIONS.
For primary bibliographic entry see Field 06E.
W72-13948

SANDUSKY HARBOR, ERIE COUNTY, OHIO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.

Available from the National Technical Information Service as PB-205 795-D, $3.00 in paper copy. November 23, 1971. 10 p, 2 map, 1 dwg.

Descriptors: *Ohio, *Dredging, *Harbors, *Environmental effects, Channel improvement, Channel morphology, Lake Erie, Watercourses (Legal), Water pollution sources, Water pollution effects, Turbidity, Sedimentation, Spoil banks, Disposal, Eutrophication, Operation and maintenance, Maintenance.
Identifiers: *Environmental impact statement, *Sandusky (Ohio).

The project involves annual channel maintenance dredging of approximately 600,000 cubic yards of spoil in the deep-draft navigation project in Sandusky Harbor, Ohio. Additionally the project involves maintenance and repair of harbor jetties, protection works, and a rock dike as needed. The dredge spoil is dumped in an open, one mile square area of Lake Erie. Adverse environmental effects of this action include the following: noise and dust during structural repair work, short-term turbidity and sedimentation, accelerated algae growth in disposal areas due to increased oxygen availability, possible adverse fish effects from polluted spoil, and further contamination of the already polluted lake from dumping polluted spoil. No quantitative measurements have been made of these effects. The only practical alternative at present is to use other dumping sites. This was considered. A plan is currently being discussed with local officials to construct an enclosed area for permanent confinement of spoil. This would be environmentally beneficial since it would prevent polluted spoil from further contaminating the lake. Also the filled area would ultimately be usable for agriculture or recreation. (Grant-Florida)
W72-13950

RURAL ENVIRONMENTAL ASSISTANCE PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Agricultural Stabilization and Conservation Service, Washington, D.C. Conservation and Land Use Programs.

Available from the National Technical Information Service as PB-202 651-D, $3.00 in paper copy. September 10, 1971. 7 p.

Descriptors: *Pollution abatement, *Soil conservation, *Environmental effects, *Project planning, *Government supports, Government finance, Governmental interrelations, Decision making, Alternate planning, Non-structural planning, Administration, Federal project policy, Land management, Agricultural runoff, Erosion control, Wildlife habitats, Sediment control, Waste disposal, Farm wastes, Retention, Drainage practices.
Identifiers: *Environmental impact statement, *Rural Environmental Assistance Program.

Under the Rural Environmental Assistance Program, the federal government shares with farmers and ranchers the cost of carrying out approved soil, water, woodland, and wildlife conservation and pollution abatement practices on their land. This program will accelerate and make possible needed conservation and environmental protection in rural America. Favorable economic effects will include: reduction in wind and water erosion and land runoff; reduction in pollution of streams, lakes, and estuaries by animal waste and sediment; more food and better habitat for wildlife; and improved water quality because of water retaining and retarding measures such as dams and ponds, grass cover, waterways, terraces, diversion structures, and buffer or filter strips around fields. No adverse environmental effects would be anticipated under this redirected and improved program if good management is carried out by all program participants. Several precautions have been taken. Several alternatives were considered, however, it was concluded that environmental quality would suffer under such alternatives. (Widman-Florida)
W72-13953

DIKED DISPOSAL AREA PROGRAM, DULUTH-SUPERIOR HARBOR, ST. LOUIS COUNTY, MINNESOTA AND DOUGLAS COUNTY, WISCONSIN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.

Available from the National Technical Information Service as PB-204 456-D, $3.00 in paper copy. September 30, 1971. 13 p, 1 plate.

Descriptors: *Lake Superior, *Environmental effects, *Dikes, *Spoil banks, Barriers, Disposal, Environmental sanitation, Isolation, Water pollution, Adoption of practices, Waste disposal, Wisconsin, Minnesota, Project planning, Recreation, Waterfowl, Habitats, Dredging, Benthos, Soil contamination, Pollution abatement, Water pollution control, Project purposes, Pollutants.
Identifiers: *Environmental impact statement, *Duluth-Superior Harbor.

The authorized project provides for diked disposal of polluted maintenance dredge spoil from Duluth-Superior Harbor. Polluted dredge spoil, previously dumped in open waters of Lake Superior, will be confined in two diked disposal areas. Beneficial impacts include the elimination of adverse effects of polluted spoil in the lake and the creation of about 35 acres of new land at each site. The cities of Duluth and Superior plan to install public recreation facilities on the sites after they have been filled. Undesirable impacts include turbidity of harbor water during construction of the diked areas, unsightliness during construction and filling, loss of some duck habitat, and possible noxious odors. The areas which have been selected for disposal are not especially aesthetic and there are no significant values which might be impaired. Alternatives to the proposed method of dredge disposal include continued in-lake disposal of polluted dredge spoil, discontinuance of maintenance dredging in the harbor, disposal at alternate sites, treatment of polluted dredge spoil, and modification of current methods and equipment which might reduce the interface contact between water and polluted spoil. (Widman-Florida)
W72-13954

LOST CREEK LAKE PROJECT, ROGUE RIVER, OREGON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 08D.
W72-13965

AQUATIC PLANT CONTROL PROGRAM, HUDSON AND MOHAWK RIVERS, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 04A.
W72-13967

PROGRAM STATEMENT FOR THE PROPOSED PROTOTYPE OIL SHALE LEASING PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 03E.
W72-13969

RADIOACTIVE WASTE MANAGEMENT PRACTICES IN WESTERN EUROPE.
European Nuclear Energy Agency, Paris (France); and Organization for Economic Co-Operation and Development Paris (France).

Available from OECD Publications Center, 1750 Pennsylvania Ave. N.W., Washington, D.C., 20006,for $3.25. European Nuclear Energy Agency, Organisation for Economic Co-operation and Development, July 1971. 126 p, 9 fig, 6 tab, 18 ref, 5 annexes.

Descriptors: *Nuclear powerplants, Effluents, *Management, *Radioactivity, *Radioisotopes, *Radioactive waste disposal, *Nuclear wastes, Environment, Air pollution, Water pollution, Soil contamination, Regulation, Control, Management, Monitoring, Standards, Europe.

A simplified general review of practices applied to management of radioactive wastes in Western Europe is presented. Both the complexity and the magnitude of the problem is indicated but have proven to be manageable and at a very high standard of safety for the personnel and the environment. Means are provided whereby public health authorities may regulate, in the public interest, radioactive waste management. The whole scope of waste management practices are discussed and encouragement given for periodic reviews to adequately maintain the high standards of environmental and public protection. (Houser-ORNL)
W72-13983

A STUDY OF PHOSPHATE INDUCED ALGAL GROWTH IN ORDER TO SUPPRESS OR ELIMINATE THIS PHENOMENON,
New Mexico State Univ., University Park. Water Resources Research Inst.
For primary bibliographic entry see Field 05A.
W72-13992

GROUNDWATER RESOURCES OF SALINE COUNTY, MISSOURI,
Geological Survey, Rolla, Mo. Water Resources Div.
For primary bibliographic entry see Field 02F.
W72-14011

THE BIODEGRADATION OF OIL IN SEA-WATER FOR NAVAL POLLUTION CONTROL,
Naval Civil Engineering Lab., Port Hueneme, Calif.
For primary bibliographic entry see Field 05B.
W72-14012

WATER FOR ALABAMA, THE ALABAMA WATER-RESOURCES SPECTRUM--SECOND PROGRESS REPORT,
Geological Survey, University, Ala.
H. C. Barksdale, and L. B. Peirce.
Alabama Geological Survey Report, July 1972. 74 p, 2 tab.

Descriptors: *Water resources development, *Alabama, *Water supply, *Water quality, Reviews, Planning, Surface waters, Groundwater, Water utilizations, Hydrology, Geology, Water pollution, Environmental effects, Ecology, Fish, Wildlife, Irrigation, Industrial water, Municipal water, Navigation, Powerplants, Flood control, Recreation, Water quality control.

The Alabama Water-Resources Spectrum (second progress report) includes a wide variety of constituent parts, each of which involves physical factors that have an impact upon or involve human activities, and hence must be considered in comprehensive planning for the waters and related lands of the State. The inclusion of physical factors (or their measurement and evaluation) in the definition of the spectrum distinguishes it from other elements of the planning procedure that are concerned primarily with legal, economic, or administrative matters. The spectrum forms the physical foundations upon which these other elements must be based if the resulting plans are to be effective and viable. The breadth of this concept of the spectrum has introduced difficulties in its description and analysis while at the same time making it imperative that they be attempted and be as complete as possible. If present trends continue, the quality of Alabama's water will become a serious problem long before any actual statewide shortage of water occurs. With this in mind, emphasis is placed upon water-quality factors and effects. (Woodard-USGS)
W72-14024

AIR CODE AND WATER QUALITY CRITERIA FOR INTERSTATE STREAMS FOR STATE OF ARKANSAS.
Arkansas Pollution Control Commission, Little Rock.
For primary bibliographic entry see Field 06E.
W72-14044

PHOSPHORUS IN WASTEWATER,
New York State Dept. of Environmental Conservation, Albany. Environmental Quality Research and Development Unit.
For primary bibliographic entry see Field 05B.
W72-14046

BIOLOGICAL DENITRIFICATION USING FLUIDIZED GRANULAR BEDS,
New York State Dept. of Environmental Conservation, Albany. Environmental Quality Research and Development Unit.
For primary bibliographic entry see Field 05D.
W72-14047

THE DISPOSAL WELL ACT.
Texas Water Quality Board, Austin.
For primary bibliographic entry see Field 06E.
W72-14050

REPORT FOR THE 12 MONTH PERIOD JULY 1, 1970-JUNE 30, 1971,
Rhode Island Dept. of Health, Providence. Div. of Water Supply and Pollution Control.
For primary bibliographic entry see Field 05A.
W72-14051

FERTILIZER TECHNOLOGY AND USE.
For primary bibliographic entry see Field 03F.
W72-14101

MAN AND HIS ENVIRONMENT: CLIMATE,
For primary bibliographic entry see Field 06G.
W72-14137

HYGIENIC STANDARDIZATION OF PHENOL IN WATER BODIES (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
For primary bibliographic entry see Field 05F.
W72-14157

THE PERSISTENCE OF ENDOSULFAN IN SURFACE WATER,
Rijksinstituut voor de Volksgezondheid, Utrecht (Netherlands).
For primary bibliographic entry see Field 05B.
W72-14193

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

FUTURE WATER USE MODEL OF UTAH VALLEY,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 04A.
W72-13928

THE RIVER BASIN MODEL: THE SOCIAL SCIENCE LABORATORY.
Environmetrics, Inc., Washington, D. C.

Copy available from GPO Sup Doc EP 2.10:16110 FRU 12/71-13 for $2.00. Environmental Protection Agency, Water Pollution Control Research Series, December 1971. 270 p, 29 fig, 15 tab, 309 ref. EPA Program 16110 FRU 12/71-13. 14-12-959.

Descriptors: *Urban sociology, *Education, *Regional analysis, *Decision making, *Computer models, Computer programs, Social aspects, Political aspects, Governments, Economics, Water resources.
Identifiers: Gaming-simulation.

The RIVER BASIN MODEL delineates an entire regional system and its interaction with water, one of its subsystems. Presented is a gaming-simulation, City Model, designed by individuals who later founded Environmetrics, Inc., to provide college-level social science students with an educational technique which reverts to a more personalized education (computer assisted laboratory) and at the same time allows society to remain undisturbed by the learning process. Students are interested in actively participating in the solutions of our social ills. In the model, participants are decision-makers in one of three sectors: economic, social or governmental. A starting scenario briefly describes problems, issues, growth characteristics, housing, schools, etc. in the simulated metropolitan area. When the model is underway, the characteristics of the city will reflect the actions and interactions of the participants. The computer records participant decisions for each round and regularly provides printouts showing the interaction of decisions and their influence during the run. The model will respond to, and the play canbe enhanced by, a nearly infinite variety of player actions generated by curiosity, imagination, innovation or planning, programming, and budgeting. The City Model is described in detail and full reports of its successful implementation in several American colleges are presented. (See also W72-10307) (Bell-Cornell)
W72-13929

THE RIVER BASIN MODEL: CHAIRMAN AND COUNCIL.
Envirometrics, Inc., Washington, D.C.

Copy available from GPO Sup Doc EP2.10:16110 FRU 12/71-5 for $0.70; microfiche from NTIS as PB-212 007, $0.95. Environmental Protection Agency, Water Pollution Control Research Series, December 1971. 80 p, 15 fig, 3 tab, 1 append. EPA Program 16110 FRU 12/71-5. 14-12-959.

Descriptors: *Regional analysis, *Decision making, *Simulation analysis, *Political aspects, *Planning, *Computer programs, *Municipal water, *Water allocation (Policy), *Water demand, *Water users, Water pollution control, Treatment, Model studies, Human population, Systems analysis.
Identifiers: *Governmental processes, *Gaming-simulation.

The RIVER BASIN MODEL is a man-machine simulation model used to delineate the interactions taking place, within a real or hypothetical area, between the local water system and the economic, social and governmental activities of that area; it is a model of an entire regional system, with water a subsystem realistically interacting with all the other major subsystems, such as housing and transportation. A gaming format is employed; model users provide inputs to the computer programs on behalf of business activities in the Economic Sector, groups of people or population units in the Social Sector, and government departments in the Governmental Sector. The Governmental (provides public services) Sector and the model required by its Chairman team, and the computer printed output are described. Each political jurisdiction has a chief executive called the Chairman. Depending upon the local situation, these political jurisdictions may or may not have a council that provides checks and balances on the Chairman. The Chairman makes departmental ap-

pointments to the local government departments, and he sets budget policy decisions. His office is an elected one, and periodic elections are held in which the members of the Social Sector vote for nominated candidates. He can exert loose or tight control over his departments. (See also W72-10307) (Bell-Cornell)
W72-13930

EXTENSIONS OF MATHEMATICAL PROGRAMMING FOR REGIONAL WATER QUALITY MANAGEMENT,
California Univ., Los Angeles. Graduate School of Management.
For primary bibliographic entry see Field 05G.
W72-13931

DYNAMIC MULTISECTOR PROGRAMMING APPROACH TO REGIONAL WATER RESOURCE MANAGEMENT,
Tahal Consulting Engineers Ltd., Tel-Aviv (Israel). Research and Development Div.
J. Bargur.
Water Resources Research, Vol 8, No 4, p 801-817, August 1972. 3 fig, 5 tab, 15 ref.

Descriptors: *Water management (Applied), *Planning, *Regional analysis, Water resources, Resource allocation, Optimization, Linear programming, *Calfiornia, Systems analysis, Model studies.
Identifiers: Equilibrium analysis.

In arid and semiarid areas, water is scarce and requires an intersectoral, intertemporal, and sometimes interregional planning approach to insure its efficient use and allocation among the competing factors. In most cases, the water scarcity is an economic phenomenon that is partially determined by the costs of undertaking water development and water transfer projects. Presented is a multisector planning and management approach to water resources that is based on a general equilibrium analysis using input-output models and linear programming techniques. A dynamic multisector programming model that takes into account the sectoral, spatial, and temporal aspects of regional planning and an extension to an activity analysis model are formulated and applied empirically to California and the western United States for a 15-year planning horizon. Results include water requirement forecasts, interregional water transfer requirements, efficient production and cropping patterns, 'shadow prices' for water and labor, and an optimal investment program for water resource projects. Using a general equilibrium programming model makes it possible to investigate problems of regional development that are dependent on the interrelationships between resource availabilities and sectoral planning and illustrates the importance of the complex interdependencies among economic variables. (Bell-Cornell)
W72-13933

RECREATION BENEFIT ESTIMATION AND FORECASTING: IMPLICATIONS OF THE IDENTIFICATION PROBLEM,
Resources for the Future, Inc., Washington, D.C.
C. J. Cicchetti, V. K. Smith, J. L. Knetsch, and R. A. Patton.
Water Resources Research, Vol 8, No 4, p 840-850, August 1972. 2 fig, 1 tab, 29 ref.

Descriptors: *Recreation demand, *Supply, *Benefits, *Estimating, Mathematical models, Systems analysis, Forecasting, Water demand, Water supply.
Identifiers: Equilibrium models, Economic models.

Recreation studies have tended to confuse the terms demand and use. Demand, as used by economists, refers to the schedule of quantities that the community will desire at all possible prices. Use, or participation, is the realization of both demand and supply considerations, i.e., the quantity of recreational services chosen by the community. Accordingly, both demand and supply forces are important to use determination. A priori information in addition to the data must be supplied prior to the estimation of economic models of the recreation market. The type of information and the data themselves impose constraints on the specification, estimation and use of these economic models. Therefore, a taxonomy of each applied study framed around a general equilibrium model of recreation decisions is presented, and the specific applied studies are discussed. Resulting from this taxonomy is a clear outline of the logical structure connecting the theoretical model with its empirical realization. This article is pertinent to the problem of recreational water supply and demand. (Bell-Cornell)
W72-13934

A MULTILEVEL APPROACH TO DETERMINING OPTIMAL TAXATION FOR THE ABATEMENT OF WATER POLLUTION,
Case Western Reserve Univ., Cleveland, Ohio. Systems Engineering Div.
For primary bibliographic entry see Field 05G.
W72-13935

ENGINEERING AND ECONOMIC EVALUATION OF THE RELIABILITY OF WATER SUPPLY,
Mekoroth Water Co., Tel-Aviv (Israel). Research Div.
For primary bibliographic entry see Field 06D.
W72-13936

6B. Evaluation Process

THE ALLOCATION OF REGIONAL WATER SUPPLIES. A CASE STUDY OF THE NORTHEASTERN UNITED STATES,
Cornell Univ., Ithaca, N.Y.
W. B. Strandberg.
Available from University Microfilms, Ann Arbor, Michigan, Order No. 68-678, Microfilm $3.05, Xerox $10.60. Ph. D. Dissertation, 1967, 235 p.

Descriptors: *Water supply, *Regional analysis, *Planning, *Economic prediction, Governments, Economic justification, Costs, Economies of scale, Reservoirs, Water shortage, Water treatment, Northeast U S, Pipelines, Water demand.

A case study analysis is presented of the problem of municipal and industrial water supply in the Northeastern United States. Technical practices and economic theory were combined to define the costs over a range of high-level demands for several basin alternatives in a subregion of the Northeast based on the metropolitan area of New York City and northeastern New Jersey. It was found that costs of the basin systems over the range of yields were reasonable, with appreciable economies of scale at higher outputs. Limited cost savings could be obtained through stage construction, essentially through programming of reservoir construction over the demand buildup period. Data collection of the type necessary to regional water supply studies was being carried on to some extent. However, considerable gaps in availability existed. There appeared to be a need for a subregional organization entity, with representatives from all affected governmental levels, to coordinate the planning and operational efforts properly. (Galwardi-Texas)
W72-13698

THERMAL AQUACULTURE: ENGINEERING AND ECONOMICS,
Oak Ridge National Lab., Tenn.
W. C. Yee.
Environmental Science and Technology, Vol 6, No 3, p 232-237, March 1972. 3 photo, 4 fig, 4 ref.

Descriptors: *Economics, *Fish, *Fish conservation, Aquaculture, Hydroelectric plants, Costs, *Thermal pollution, Legal aspects, Marketing, Resources, Planning.
Identifiers: *Thermal aquaculture, *Waste heat, Regulatory aspects, Demonstration projects, Technical feasibility.

Fish may be raised in warm water discharged from steam electric power plants, but success depends upon costs and profits. Aquaculture is a term that has come to imply a degree of environmental control over the culture medium such that fish yields are enhanced by orders of magnitude. Thermal aquaculture has a potential that remains to be demonstrated. Considerations of technical feasibility, legal and regulatory aspects (on a federal, state, and local level), and marketing aspects reveal hurdles which must be dealt with. Finally, site-oriented demonstration projects will have to show the revenue-producing potential of thermal aquaculture and the extent to which it can assist in helping to pay for the cost of dissipating waste heat from an electric power plant. The resource value of this waste might then be estimated, and a liability of the present might be turned into an asset of the future. Design and cost factors, a cost analysis of a hypothetical integrated aquaculture facility, and aspects of marketing and economics are discussed. (Strachan-Chicago)
W72-13743

ECONOMIC EFFICIENCY IN THE ALLOCATION OF IRRIGATION WATER OVER TIME,
Oklahoma Water Resources Research Inst., Stillwater.
V. R. Eidman.
Available from the National Technical Information Service as PB-212 003, $3.00 in paper copy, $0.95 in microfiche. Completion Report, August 1972, 293 p, 16 fig, 44 tab, 113 ref. OWRR B-010-OKLA (4).

Descriptors: *Water allocation, *Economic efficiency, *Direct benefits, *Groundwater mining, Groundwater, *Irrigation Water, Economics, Farm management, Water demand, Irrigation practices, Forecasting, Dynamic programming, Linear programming, Computer models, Simulation analysis, Soil-water-plant relationships, Oklahoma, Texas, Kansas, Great Plains, Water policy, Water resource development, Progressive taxes, Water management (Applied), Yield equations.
Identifiers: *Ogallala Formation.

The acreage of irrigated crop production in the region overlying the Central Ogallala Formation has increased from approximately 70,000 in 1950 to 1.5 million in 1965. Annual water withdrawals have exceeded estimated annual recharge since 1954. Resource availability and the demand for the crops produced in the area suggest irrigation will continue to expand. Projections made assuming current institutional restrictions indicate the number of acres irrigated annually will increase to a peak of 3.4 million in 1990 and then decline to 2.8 million by the year 2000. The projected rate of development utilizes 43.5 percent of the stock water supply by the year 2000, making irrigation uneconomic on approximately 44 percent of the area. Estimated primary economic benefits are approximately 250 million per year for the 1970-1990 period and then decline rapidly. Application of a multi-stage sequential decision model indicated the projected rates of withdrawal during the remainder of this century do not exceed the rates required to maximize the present value of net primary benefits for the study area. Analysis of institutional constraints indicates imposing a quantity restriction of 1.5 acre feet annually per acre irrigated would reduce primary economic benefits bothper acre irrigated and per unit of water used. However, imposing a tax of $6.00 per acre foot of

water used above 1.5 acre feet per acre irrigated would increase benefits both per acre irrigated and per unit of water used. Additional analysis of alternative taxing arrangements is needed before a specific plan is recommended for use in the Central Ogallala.
W72-13823

ESTIMATED USE OF WATER IN THE UNITED STATES IN 1970,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 06D.
W72-13829

THE RIVER BASIN MODEL: THE SOCIAL SCIENCE LABORATORY.
Environmetrics, Inc., Washington, D. C.
For primary bibliographic entry see Field 06A.
W72-13929

THE RIVER BASIN MODEL: CHAIRMAN AND COUNCIL.
Envirometrics, Inc., Washington, D.C.
For primary bibliographic entry see Field 06A.
W72-13930

EXTENSIONS OF MATHEMATICAL PROGRAMMING FOR REGIONAL WATER QUALITY MANAGEMENT,
California Univ., Los Angeles. Graduate School of Management.
For primary bibliographic entry see Field 05G.
W72-13931

DYNAMIC MULTISECTOR PROGRAMMING APPROACH TO REGIONAL WATER RESOURCE MANAGEMENT,
Tahal Consulting Engineers Ltd., Tel-Aviv (Israel). Research and Development Div.
For primary bibliographic entry see Field 06A.
W72-13933

RECREATION BENEFIT ESTIMATION AND FORECASTING: IMPLICATIONS OF THE IDENTIFICATION PROBLEM,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 06A.
W72-13934

AUTHORIZATION OF FEDERAL WATER PROJECTS (FINAL REPORT, DRAFT REVIEW),
National Water Commission, Arlington, Va.
N. Ely.
Available from the National Technical Information Service as PB-206 096, $3.00 in paper copy. November 1971. 226 p, 525 ref, 1 append.

Descriptors: *Water resources development, *Project planning, *Federal government, *Decision making, Political aspects, Legal aspects, Administrative agencies, Institutional constraints, Cost analysis, Cost-benefit analysis, Water policy, Budgeting, Adoption of practices, Federal budget, Administration, Federal jurisdiction, Comprehensive planning.
Identifiers: *Federal Water Projects Policy.

The major federal agencies involved with water resource development construction projects are identified, such as the Bureau of Reclamation, the Corps of Engineers, the Soil Conservation Service, and the Federal Power Commission. Also identified are reviewing and lending agencies. The process of project development from initial conception, through planning stages, to construction is examined. Also discussed is the process of congressional authorization and control by the Office of Management and Budget. Some of the problems individual agencies encounter in the process of water resource development are examined. Problems which are common to several agencies are discussed as well as conflicts which arise between agencies. The problems caused by Congress are also discussed. Among the author's conclusions are recommendations for consolidating and centralizing water resource development planning and for developing a hearing procedure early in the authorization process for project opponents. (Grant-Florida)
W72-13957

THE RECREATIONAL VALUE OF A SMALL RESERVOIR IN AN ARID ENVIRONMENT,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 06D.
W72-13994

WATER FOR ALABAMA, THE ALABAMA WATER-RESOURCES SPECTRUM--SECOND PROGRESS REPORT,
Geological Survey, University, Ala.
For primary bibliographic entry see Field 05G.
W72-14024

POTENTIALS FOR DESALTING WATER IN THE TULAROSA BASIN, NEW MEXICO - A CASE STUDY,
New Mexico State Univ., University Park. Water Resources Research Inst.
For primary bibliographic entry see Field 03A.
W72-14059

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

A MULTILEVEL APPROACH TO DETERMINING OPTIMAL TAXATION FOR THE ABATEMENT OF WATER POLLUTION,
Case Western Reserve Univ., Cleveland, Ohio. Systems Engineering Div.
For primary bibliographic entry see Field 05G.
W72-13935

6D. Water Demand

THE ALLOCATION OF REGIONAL WATER SUPPLIES. A CASE STUDY OF THE NORTHEASTERN UNITED STATES,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 06B.
W72-13698

ENVIRONMENTAL GEOLOGY AND HYDROLOGY, TALLAHASSEE AREA, FLORIDA.
Florida Dept. of Natural Resources, Tallahassee. Bureau of Geology.

Florida Bureau of Geology Special Publication No 16, 1972. 61 p, 47 ref.

Descriptors: *Water resources, *Hydrology, *Geology, *Florida, Topography, Mineralogy, Water utilization, Municipal water, Industrial water, Recreation, Groundwater, Water wells, Surface waters, Lakes, Streams, Water yield, Water quality, Water demand, Reviews.
Identifiers: *Tallahassee (Fla).

This pictoral review describes the relationships between environment and hydrology in the Tallahassee, Florida, area. Pictures, maps, illustrations, and literature include descriptions pertinent to topography, geology, water resources, mineral resources, energy resources, and land use. Normal yearly rainfall ranges from 57 inches in southwestern Leon County to about 52 inches in the northeastern part of the county. Leon County's physical features are separated into four major divisions--the high, sandy, clay-hill northern part; the wet, low, sand and limestone southern part, dotted with innumerable small lakes and sinks; the flat, sandy, swampy, and forested western part; and the valleys of the two major rivers. Water for the city of Tallahassee's system is pumped from 13 wells, ranging from 18 to 24 inches in diameter and from 290 to 470 feet deep. Their total rated capacity is 34 mgd. Surface water in Leon County is of good chemical quality, being soft (hardness ranging from 0 to 60 mg/liter) and low in chloride and dissolved solids. Recreation activities constitute its primary use. Most wells in the county yield hard water (121 to 180 mg/liter) and produce water suitable for use without treatment. (Woodard-USGS)
W72-13740

ECONOMIC EFFICIENCY IN THE ALLOCATION OF IRRIGATION WATER OVER TIME,
Oklahoma Water Resources Research Inst., Stillwater.
For primary bibliographic entry see Field 06B.
W72-13823

ESTIMATED USE OF WATER IN THE UNITED STATES IN 1970,
Geological Survey, Washington, D.C.
C. R. Murray, and E. B. Reeves.
Geological Survey Circular 676, 1972. 37 p, 12 fig, 18 tab, 76 ref.

Descriptors: *Water utilization, *United States, Surface waters, Groundwater, *Water supply, *Consumptive use, *Water demand, *Water distribution (Applied), Domestic water, Municipal water, Industrial water, Irrigation water, *Estimating.

Estimates of water use in the United States in 1970 indicate that an average of about 370 bgd (billion gallons per day)-about 1,800 gallons per capita per day-was withdrawn for the four principal offchannel uses which are (1) public-supply (for domestic, commercial, and industrial uses), (2) rural (domestic and livestock), (3) irrigation, and (4) self-supplied industrial (including thermoelectric power). In 1970, withdrawals for these uses exceeded by 19% the 310 bgd estimated for 1965. Estimates of water withdrawn from the principal sources included 68 bgd from fresh groundwater, 1 bgd came from saline groundwater, 250 bgd came from fresh surface water, 53 bgd from saline surface water, and 0.5 bgd from reclaimed sewage. The average annual streamflow-simplified measure of the total available water supply-is approximately 1,200 bgd in the conterminous United States. Total water withdrawn in 1970 for offchannel uses (withdrawals other than for hydroelectric power) amounted to about 30% of the average annual streamflow. (Woodard-USGS)
W72-13829

THE RIVER BASIN MODEL: CHAIRMAN AND COUNCIL.
Envirometrics, Inc., Washington, D.C.
For primary bibliographic entry see Field 06A.
W72-13930

RECREATION BENEFIT ESTIMATION AND FORECASTING: IMPLICATIONS OF THE IDENTIFICATION PROBLEM,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 06A.
W72-13934

ENGINEERING AND ECONOMIC EVALUATION OF THE RELIABILITY OF WATER SUPPLY,
Mekoroth Water Co., Tel-Aviv (Israel). Research Div.
E. Damelin, U. Shamir, and N. Arad.

Water Resources Research, Vol 8, No 4, p 861-877, August 1972. 10 fig, 5 tab, 4 ref.

Descriptors: *Water demand, *Water supply, *Reliability, Pumping, Equipment, Failure (Mechanics), Simulation analysis, Computers, Costs, Economics, Evaluation, Mathematical models, Reservoir storage, Operations research.
Identifiers: *Reliability models, Economic models, Sensitivity, Sensitivity analysis, Marginal water costs.

Assuming that a given water supply source is sufficiently large and that the installed equipment and the storage in the system are designed so that all demands can be met, shortfalls will occur only when some of the equipment is not operative due to failure. A simulation model is developed and employed for evaluating the reliability of supplying a known demand pattern in a given water supply system in which shortfalls are caused by random failtures of the pumping equipment. An economic model is presented that enables the reliability model users to compute the cost of the marginal water obtained by improving the reliability of the system and to determine the desirability of the improvement from this cost computation. Results are presented from the initial tests of the reliability model, that examine the sensitivity of the reliability to various variables. The results of applying the reliability and economic models to an existing water supply system are presented and discussed. (Bell-Cornell)
W72-13936

AN INTEGRATION OF THE AGRICULTURAL DEMAND FUNCTION FOR WATER AND THE HYDROLOGIC MODEL OF THE PECOS BASIN,
New Mexico State Univ., University Park. Water Resources Research Inst.
M. Gisser, and A. Mercado.
Available from the National Technical Information Service as PB-212 027, $3.00 in paper copy, $0.95 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Completion Report 004, June 1972, 33 p, 1 fig, 6 tab, 11 ref. OWRR B-025-NMEX (1).

Descriptors: *Water demand, *Hydrologic Models, *Water pricing, *New Mexico, Irrigation water, Water table, Aquifers, Confined aquifers, Recharge, Model studies.
Identifiers: *Pecos River Basin, *Parametric linear programming, *Water importation, Economic model, Demand function, Semi-confined aquifers, Imported water prices, Pumping costs.

The results of integrating the agricultural sector with the aquifer of the Pecos Basin are presented. In particular it provides steady-state solutions to hydrologic and economic equations in which imported water is artificially recharged to the aquifer and its cost is added to the cost of pumping. A two cell model for the Pecos Basin aquifer is developed. One cell is for the confined aquifer and the other is for the shallow aquifer. The hydrological solution of the model yields two linear steady-state functions which relate the water table in the two cells to other hydrological variables, such as recharge, discharge, and irrigation. The cost of pumping water is also estimated. The agricultural demand function for irrigation water is empirically estimated by applying the technique of parametric linear programming. The demand function for water is then linked to the water table hydrological equations. Solutions are given for a range of expected prices of imported water. (Creel-NMex State)
W72-13993

THE RECREATIONAL VALUE OF A SMALL RESERVOIR IN AN ARID ENVIRONMENT,
Arizona Univ., Tucson. Dept. of Watershed Management.
D. A. King.
Available from the National Technical Information Service as PB-212 028, $3.00 in paper copy, $0.95 in microfiche. Completion Report, Aug. 1971, 9 p, 1 tab, 4 ref. OWRR A-026-ARIZ (1).

Descriptors: *Recreation demand, *Water demand, *Reservoirs, Benefit-cost analysis, *Arid land, Deserts, *Arizona.
Identifiers: *Tucson (Ariz).

The purpose of this investigation was to measure the recreational value of a small reservoir and to compare value estimates obtained using four different price proxies. The study area was Pena Blanca Recreation area, a Forest Service area about 70 miles south of Tucson. An on-site survey of visitors to the area was conducted. The equivalent consumers' surplus is the measure of value being used. The price proxies are willingness to pay, to drive additional miles, to drive additional hours, and variable participation costs. The quantity variable is visits per year. Multiple correlation analysis has been used to identify the important control variables for estimation of the consumers' surplus. The control variables identified were age of the family head and recreational equipment investment. Income was not highly correlated with visits or any of the price proxies, indicating that the income effect in the demand for the area is small. No significant differences in socioeconomic characteristics were found between day and overnight visitors. The mean willingness to pay, in terms of a fee per person per visit, was $1.15. The mean willingness to drive, in terms of additional one-way miles, was 30 miles. The mean willingness to drive, in terms of additional time, was 1 hour.
W72-13994

USE OF WATER IN ARKANSAS, 1970,
Geological Survey, Little Rock, Ark.
H. N. Halberg.
Arkansas Geological Commission Water Resources Summary No 7, 1972. 17 p, 3 fig, 6 tab, 39 ref.

Descriptors: *Water utilization, *Arkansas, *Surface waters, *Groundwater, *Water supply, Water demand, Consumptive use, Water distribution (Applied), Municipal water, Industrial water, Domestic water, Irrigation water.

Arkansas used an average of 3,061 mgd of surface water and groundwater in 1970, 28% more than in 1965. This total does not include the 24,700 mgd used in the production of hydroelectric power. Half the water supplied was groundwater and half was drawn for streams and reservoirs. The principal categories of use are public supply, self-supplied industrial use, rural domestic and livestock use, irrigation, fish and minnow farming, water for wildlife impoundments, and fuel electric-power production. The principal use was irrigation, which used 1,293 mgd, or a little less than half the total, and 82% of which was groundwater. Cooling water for fuel electric-power production required 956 mgd, 31% of the total, and was practically all surface water. Fish and minnow farming used 314 mgd, 10% of the total. Consumption of water was 1,226 mgd, 40% of withdrawals. (Woodard-USGS)
W72-14028

6E. Water Law and Institutions

RESPONSIBILITY FOR PLANT OPERATIONS,
Maryland State Dept. of Health and Mental Hygiene, Baltimore.
For primary bibliographic entry see Field 05F.
W72-13742

OIL POLLUTION OF THE MARINE ENVIRONMENT - A LEGAL BIBLIOGRAPHY,
University of Southern California, Los Angeles.
For primary bibliographic entry see Field 05G.
W72-13904

POLITICS AND THE COLORADO RIVER,
Arizona Water Commission, Phoenix.
W. E. Steiner.
In: Hydrology and Water Resources in Arizona and the Southwest, Proceedings, Arizona Section - American Water Resources Association and the Hydrology Section - Arizona Academy of Science, April 22-23, 1971, Tempe, Vol 1, p 405-418, 1971.

Descriptors: *Colorado River Compact, *Colorado River Basin, *Political aspects, *International waters, *Arid lands, Arizona, California, Wyoming, New Mexico, Colorado, Utah, Nevada, Inter-basin transfers, Water law, Pacific Northwest U. S., Mexico, Water allocation (Policy), Legal aspects.
Identifiers: *Central Arizona Project.

The Colorado River is the only major stream in the U.S. whose water supply is fully utilized. This distinction has brought the Colorado more than its share of controversy, within states, between states and between nations. The Colorado River Compact, whose purpose was to equitably apportion the waters between the Upper and Lower Basins and to provide protection for the Upper Basin through water reservation, was ratified by all states except Arizona, in 1923. Arizona finally ratified it in 1944. The history of controversies and negotiation concerning the Compact are outlined through the Supreme Court decision on March 9, 1964, which entitled California to 4.4 maf, Nevada to 0.3 maf and Arizona to 2.8 maf, of the first 7.5 maf available in the Lower Colorado. Unfortunately, the Court did not attempt to establish priorities in the event of shortage. The problem is complicated by an international treaty of 1944, guaranteeing Mexico 1.5 maf annually, except in years of unusual circumstances. Because Senator Connally of Texas was then chairman of the Senate Foreign Relations Committee and because the Treaty allocated twice as much Colorado River water to Mexico as it was then using, it was argued that this treaty represented a tradeoff to Mexico, giving it less water from the Rio Grande in exchange for more water from the overburdened Colorado. Problems of inter-basin water transfer studies, uniform Colorado Basin water quality standards and Central Arizona Project planning are discussed. (Casey-Arizona)
W72-13915

PRIVATE REMEDIES TO ABATE WATER POLLUTION IN VIRGINIA AND NEW THEORIES IN ENVIRONMENTAL LAW,
For primary bibliographic entry see Field 05G.
W72-13937

THE LAW AND THE CORPORATE POLLUTER: FLEXIBILITY AND ADAPTION IN THE DEVELOPING LAW OF THE ENVIRONMENT,
For primary bibliographic entry see Field 05G.
W72-13938

WATER LAW--GROUNDWATER RIGHTS IN MISSOURI--A NEED FOR CLARIFICATION (HIGDAY V. NICKOLAUS),
R. C. Thomas.
Missouri Law Review, Vol 37, No 2, p 357-368 (1972). 12 p, 57 ref.

Descriptors: *Missouri, *Judicial decisions, *Groundwater resources, *Percolating water, Legal aspects, Adoption of practices, Equity, Reasonable use, Groundwater, Alluvial aquifiers, Municipal water, Water management (Applied), Water law, Competing uses, Common law, Water allocation (Policy), Riparian rights, Adverse possession, Land tenure, Legal review, Wells, Overlying proprietor.
Identifiers: Correlative rights.

Appellant landowners sought declaratory and injunctive relief against respondent city of Columbia, Missouri, when the respondent attempted to extract groundwater from an alluvial water basin under appellants' lands. On appeal the Kansas City Court of Appeals held that appellants' petition stated a justiciable controversy and outlined a new doctrine to be used in determining rights to percolating groundwater in Missouri. After a general discussion on groundwater the author explains the five basic doctrines that have evolved to determine rights to percolating groundwater: (1) the English absolute ownership rule, (2) the reasonable use doctrine, (3) the correlative rights doctrine, (4) the California correlative rights or common pool doctrine, and (5) the prior appropriation doctrine. The author specifically deals with the evolution of groundwater law in Missouri, noting the confusion in the instant case as to whether the reasonable use or correlative rights doctrine was in fact adopted and the distinctions involved. The author concludes that the latter is preferable because it is a better balancing of interests, uses more factors in determining rights, and is more likely to reach a fair and equitable determination of water rights among competing uses. (Widman-Florida)
W72-13939

POTABLE WATERS.
For primary bibliographic entry see Field 05G.
W72-13940

THE 1973 CONFERENCE ON THE LAW OF THE SEA IN THE LIGHT OF CURRENT TRENDS IN STATE SEABED PRACTICE,
F. M. Auburn.
Canadian Bar Review, Vol 50, No 1, p 87-109 (1972). 23 p, 149 ref.

Descriptors: *Law of the sea, *Exploitation, *Continental shelf, *United Nations, Legal aspects, International law, Land tenure, Jurisdiction, Littoral, Exploration, Mineralogy, Mining, Beds under water, Ownership of beds, Oceans, Continental slope, Slurries, Manganese, Legal review.

Current uses of the seabed are discussed along with some of the controversies which exist among nations in light of the upcoming 1973 Conference on the Law of the Sea. The 1970 Moratorium Resolution of the U.N. General Assembly is discussed along with the disagreement among various international factions as to its legal effect. The extent to which adjacent states may exploit the continental shelf is also discussed. The lines of controversy are drawn between land locked and littoral states, between states with the sharp coastlines and those with gradual coastlines, and over use of the seabed of such semi-enclosed areas as the Red and Baltic Seas. The practice of the United States, Canada, New Zealand, and Australia in granting exploration licenses and controlling seabed activities are examined. The problems of controlling the extraction of Red Sea brines from the waters are discussed. Of concern here is the fact that these brines are a slurry and actually part of the water instead of the seabed. The control of the extraction of manganese nodules and the plans for expansion of the industry are described. Also mentioned is the attempt of some commercial interests to establish sovereignties beyond the jurisdiction of any state by filling in reefs in order to have a tax free base for mineral extraction and processing. It is concluded that few states have a clear concept of their national policy and that time is running out for reaching international agreement. (Grant-Florida)
W72-13941

PROPOSED RECLASSIFICATIONS OF CERTAIN WATERS IN THE BROAD, CATAWBA, FRENCH BROAD, HIWASSEE, LITTLE TENNESSEE, NEW, AND WATAUGA RIVER BASINS TO BE CONSIDERED AT A PUBLIC HEARING TO BE HELD ON JUNE 29, 1972, IN HICKORY, NORTH CAROLINA.
North Carolina Board of Water and Air Resources, Raleigh.
For primary bibliographic entry see Field 05G.
W72-13942

REQUIREMENTS FOR APPROVAL OF INDIVIDUAL SEWAGE DISPOSAL SYSTEMS.
For primary bibliographic entry see Field 05G.
W72-13943

ANALYSIS--FLORIDA WATER RESOURCES ACT OF 1972, (CHAPTER 72-299, LAWS OF FLORIDA).

Extract from report by Geraghty and Miller, Inc., Consulting Ground Water Geologists, Jacksonville, Fla. (1972). 12 p.

Descriptors: *Florida, *Water districts, *Water users, *Water utilization, Legislation, Water management (Applied), Water quality control, Water supply development, Planning, Groundwater, Surface waters, Land resources, Water resources, Legal aspects, Permits, Well permits, Water storage, Waste storage.

The analysis is intended as a guide to both users of ground and surface waters and those interested in the planning and management of water supply. The various duties of the five Water Management Districts into which the state is divided are set forth and include the management of water and land related resources, issuance of permits, providing water storage, and to work in conjunction with the Department of Natural Resources in formulating state water use and quality plans. The Florida Water Resources Act is termed 'the toughest water management Act in force in the Nation' since existing users must apply within two years after the implementation date for a permit to continue to divert water. Among other requirements, the applicant must show that his is a 'reasonable-beneficial use'. It is concluded that the Act's definition of 'reasonable-beneficial use' is vague and that its final determination will be decided by the courts. Previous court decisions have set forth a broad priority schedule for users as follows: (1) public and private utilities serving people, (2) agriculture, and (3) industrial. The Act also requires permits for the construction, repair or abandonment of any well and for the alteration of any dam or reservoir designed to impound waters which exceeds ten acres. The Act fails to cover impounding reservoirs or ponds used for storage of industrial wastes. (Ellis-Florida)
W72-13944

NATURAL RESOURCES AND RECREATION AGENCIES, 1971 ANNUAL REPORT.
State of Washington Report, (December 1971). 80 p, 29 fig, 10 tab.

Descriptors: *Administrative agencies, *Natural resources, *Recreation, *Washington, Ecology, Research and development, Political aspects, Agriculture, Water resources, Water pollution control, Water conservation, Water rights, Wells, Waste treatment, Grants, Fish management, Harbors, Aquatic environment, Salmon, Oceanography, Pollution abatement, Powerplants, Thermal powerplants, Water resources development, Institutions.

The Report covers Washington state programs dedicated to the enrichment of the quality of life for the people of the State of Washington. The Department of Ecology's principal activities include water resource management, water pollution control, solid waste management, shoreline management, and the development of a state water plan. The Department of Fisheries manages and preserves the state's fish food resources. Among its policies are the enforcement of provisions applicable to the protection of the aquatic environment and to support efforts to protect the environment. The Department of Natural Resources has among its many divisions that of surveys and marine land management whose programs include the propriety management of all state owned tidelands, shorelands, harbor areas and navigable waters' beds. The mandate of the Oceanographic Commission is to promote, develop, and advise on oceanographic matters. The Commission develops policies and identifies goals, but has no regulatory power. Also discussed is the Pollution Control Hearings Board which acts as a mediator in disputes concerning pollution matters. A Thermal Power Plant Site Evaluation Council exists to attempt to balance ecological considerations with the need for more electric power. (Ellis-Florida)
W72-13945

SIGNING OF GREAT LAKES WATER QUALITY AGREEMENT, APRIL 15.
For primary bibliographic entry see Field 05G.
W72-13947

POWERS AND DUTIES OF THE DEPARTMENT OF ENVIRONMENTAL RESOURCES, ITS OFFICERS AND DEPARTMENTAL AND ADVISORY BOARDS AND COMMISSIONS.
Pennsylvania Statutes Ann. tit. 71, secs. 510-1 thru 510-108 (Supp 1971).

Descriptors: *Pennsylvania, *Legislation, *Water resources development, *Water utilization, Water law, Legal aspects, Watercourses (Legal aspects), State governments, Administrative agencies, Regulation, Control, Administration, Consumptive use, Water supply, Water demand, Flood control, Water pollution control, Local governments, Water resources, Water management (Applied), Flood control.
Identifiers: Nuisance (Legal aspects).

The Department of Environmental Resources shall exercise the powers and perform the duties of a number of state agencies including the Department of Forests and Waters, the Water and Power Resources Board, the Water Supply Commission and the Flood Control Commission. The Department shall have authority over: conservation, marketing and distribution of the water resources; power to be derived from water resources; transportation by water; all water obstructions such as bridges and wharves; to maintain a complete inventory of all the water resources of the Commonwealth; and flood control. The Department is also given power to order the abatement of any nuisances or to enter upon premises and abate or remove such nuisance if the owner or occupant of the premises fails to comply with the order. An Environmental Quality Board is established to develop a master environmental plan for the Commonwealth. The Environmental Hearing Board is established to hold hearings and issue adjudications on any order, permit, license or decision of the Department. A unit responsible for enforcement of all laws within the jurisdiction of the Department shall be established in the Department. (Brackins-Florida)
W72-13948

AUTHORIZATION OF FEDERAL WATER PROJECTS (FINAL REPORT, DRAFT REVIEW),
National Water Commission, Arlington, Va.
For primary bibliographic entry see Field 06B.
W72-13957

PROGRAM STATEMENT FOR THE PROPOSED PROTOTYPE OIL SHALE LEASING PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 03E.

W72-13969

AIR CODE AND WATER QUALITY CRITERIA FOR INTERSTATE STREAMS FOR STATE OF ARKANSAS.
Arkansas Pollution Control Commission, Little Rock.

August 1969. 19 p, 2 fig.

Descriptors: *Arkansas, *Legislation, *Water law, *Legal aspects, *Water quality control, Water quality standards, Water pollution, Air pollution, Pollution abatement, State governments, Regulation, Control.
Identifiers: *Water quality criteria, Air code.

The 1969 Arkansas air pollution control code and water quality criteria for interstate streams are presneted. Items covered under the section on Water Quality Criteria include: the delegation of authority, the range of application of the laws, the specific standards of water quality, and the legal background of water quality laws in Arkansas. Criteria are set up to protect water quality for present and future use and include such parameters as: temperature, color, turbidity, taste, odor, solids, oils and grease, pH, bacteria, radioactivity, toxic substances, mineral quality, and dissolved oxygen. (Poertner)
W72-14044

THE DISPOSAL WELL ACT.
Texas Water Quality Board, Austin.

Agency Publication Number 72-01, February 1972. 15 p.

Descriptors: *Underground waste disposal, *Waste disposal, *Well regulations, *Texas, *Waste disposal wells, Injection wells, Legal aspects, Water quality control, Oil wastes, Municipal wastes, Water law, Legislation, Industrial wastes, Well permits, Solid wastes, Domestic wastes, State governments, Regulation, Permits, Control.

The Texas Water Quality Board prepared this extract of the 'Disposal Well Act', to present to the public the changes resulting from the recodification of Texas water laws by the Texas Legislature. Five subchapters deal with the following subjects: (1) general provisions, including the act's short title and relevant definitions; (2) regulations covering the issuance of permits for municipal and industrial wastes; (3) regulations covering the issuance of permits for oil and gas wastes; (4) general regulations setting the terms and conditions of the issuance of permits; and (5) civil and criminal remedies for violations. (Poertner)
W72-14050

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION, TALKEETNA RIVER-SUSITNA RIVER-CHULITNA RIVER, TALKEETNA, ALASKA.
Corps of Engineers, Anchorage, Alaska.
For primary bibliographic entry see Field 04A.
W72-13836

WATER BANK PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Agricultural Stabilization and Conservation Service, Washington, D.C. Conservation and Land Use Programs.
For primary bibliographic entry see Field 06G.
W72-13959

6G. Ecologic Impact of Water Development

NOTES ON THE AVIFAUNA OF THE MARSHY AREA OF PIERREPONT-SISSONNE (LAONNOIS-AISNE) II,
For primary bibliographic entry see Field 05C.
W72-13678

STUDY OF ENVIRONMENTAL IMPACTS OF ALTERNATIVE LONG ISLAND SOUND BRIDGE SITES,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
E. J. Tuthill, and J. F. Bagg.
Technical Report Series No 12, August 1971. 140 p, 4 fig, 9 tab, 136 ref.

Descriptors: *New York, *Bridge construction, *Environmental effects, *Aquatic organisms, *Birds, *Habitats, *Food habits, *Spawning, *Nesting, *Reproduction, Wetlands, Water pollution, Protection, Legislation.
Identifiers: *Long Island, Bridge sites, Comparison studies.

A study of the environmental impacts of alternative bridge sites was conducted on Long Island Sound. Principal habitats, feeding areas and spawning grounds of all present and future commercial and sport fisheries were identified. The habitats, feeding areas, nesting and reproductive areas of major and rare species of birds and wildlife were also defined. A survey was taken of the existing wetlands within the immediate area of the bridge sites and classified by ownership and biological composition. Specific environmental effects of the alternative bridge sites were compared and approaches to the Rye-Oyster Bay bridge site were assessed. Current pollution levels and potential increases due to bridge construction are documented. An examination was made of existing Federal, State and local environmental protection laws relating to potential bridge sites. (Ensign-PAI)
W72-13907

FISH AND WILDLIFE IN THE MARINE AND COASTAL ZONE, PART A, SUMMARY PLANNING INFORMATION, AND RECOMMENDATIONS,
California State Dept. of Fish and Game, Sacramento.
E. C. Greenhood.
(Comprehensive Ocean Area Plan), Appendix III, November 1971. 166 p, 20 tab, 39 ref.

Descriptors: *California, *Coasts, *Wildlife, *Water quality, *Water utilization, *Land use, *Environmental affects, *Habitat, *Biological communities, Conservation, Resources development, Legislation, Fish, Shellfish, Mammals.
Identifiers: Statewide criteria, Coastal development.

Fish and Wildlife of the marine and coastal zone were studied along with land and water quality uses. Development and inappropriate use of these areas in California could result in population decreases or even extinction of some species. It is anticipated that this information on living organisms and the habitat upon which they depend may aid in setting a general statewide criteria for coastal zone use and development. Various governmental policies on living resources are explained with recommendations and discussions. The fish and wildlife of each county is recorded to aid planners in determining assets of a specific area and to prevent destruction of habitats. Detailed data on certain species of fish, shellfish and marine mammals are presented. (Ensign-PAI)
W72-13908

THE LAW AND THE CORPORATE POLLUTER: FLEXIBILITY AND ADAPTION IN THE DEVELOPING LAW OF THE ENVIRONMENT,
For primary bibliographic entry see Field 05G.
W72-13938

NATURAL RESOURCES AND RECREATION AGENCIES, 1971 ANNUAL REPORT.
For primary bibliographic entry see Field 06E.
W72-13945

AWARD OF P.L. 660 GRANT FOR CONSTRUCTION OF WASTEWATER TREATMENT FACILITIES AND OUTFALL SEWERS--PROJECT NO. WPC-TEX-722 (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Dallas, Tex. Air and Water Programs Div.
For primary bibliographic entry see Field 05D.
W72-13949

SANDUSKY HARBOR, ERIE COUNTY, OHIO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 05G.
W72-13950

WINNEBAGO-BEAN CREEK WATERSHED, RICHARDSON COUNTY, NEBRASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-13951

RED RIVER WATERWAY AND RED RIVER WATERWAY EMERGENCY BANK PROTECTION, MISSISSIPPI RIVER TO VICINITY OF INDEX, ARKANSAS, LOUISIANA, ARKANSAS, OKLAHOMA, AND TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 08A.
W72-13952

RURAL ENVIRONMENTAL ASSISTANCE PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Agricultural Stabilization and Conservation Service, Washington, D.C. Conservation and Land Use Programs.
For primary bibliographic entry see Field 05G.
W72-13953

DIKED DISPOSAL AREA PROGRAM, DULUTH-SUPERIOR HARBOR, ST. LOUIS COUNTY, MINNESOTA AND DOUGLAS COUNTY, WISCONSIN (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Paul, Minn.
For primary bibliographic entry see Field 05G.
W72-13954

DIVELY DRAINAGE AND LEVEE DISTRICT (DISTRICT 23), ILLINOIS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Louis, Mo.
For primary bibliographic entry see Field 08D.
W72-13955

LANEPORT, NORTH FORK AND SOUTH FORK LAKES, SAN GABRIEL RIVER, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Fort Worth, Tex.
For primary bibliographic entry see Field 08A.
W72-13956

PROPOSED HYBRID PROTOTYPE DESALTING PLANT FOR BROWNSVILLE, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Office of Saline Water, Washington, D.C.
For primary bibliographic entry see Field 03A.
W72-13958

WATER BANK PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Agricultural Stabilization and Conservation Service, Washington, D.C. Conservation and Land Use Programs.

Available from the National Technical Information Service as PB-206 159-D, $3.00 in paper copy. January 31, 1972. 7 p.

Descriptors: *Wetlands, *Federal jurisdiction, *Environmental effects, *Legislation, Administrative agencies, Water law, Land use, Water policy, Wildlife conservation, Federal government, Wildlife habitats, Waterfowl, Aquatic habitats, Water levels, Mosquitos, Institutions, Runoff, Drainage practices, Drainage effects, Surface drainage.
Identifiers: *Environmental impact statement.

Under the Water Bank Program incentive payments will be made to landowners and operators for conserving waters and preserving or improving migratory waterfowl habitat and other wildlife resources. Under the program, long-term agreements are entered into with landowners or operators who agree to take certain actions. The program will help in reducing the loss of wetlands in the Nation. This will result in preserving habitat for migratory waterfowl and other wildlife resources, reduce water runoff, and build water table levels. An adverse environmental effect of the program would be the continuation of mosquito breeding grounds in some areas. An alternative would be to continue under existing arrangements, thus inducing many owners of wetlands to choose to drain their land. This program will help insure a beneficial long-term use of a part of man's environment by helping to keep it in a desirable natural and ecological state. There will be no irreversible or irretrievable commitment of resources under the program. (Waldron-Florida)
W72-13959

KINGSTREE BRANCH FLOOD CONTROL PROJECT, SOUTH CAROLINA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.
For primary bibliographic entry see Field 04A.
W72-13960

FAIRPORT HARBOR, LAKE COUNTY, OHIO (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 04A.
W72-13961

LORAIN HARBOR, OHIO (MAINTENANCE) (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 04A.
W72-13962

AUTHORIZED CHINA MEADOWS DAM AND RESERVOIR LYMAN PROJECT, WYOMING (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Salt Lake City, Utah. Region 4.
For primary bibliographic entry see Field 08D.
W72-13963

LITTLE RIVER INLET, NORTH CAROLINA AND SOUTH CAROLINA, NAVIGATION IMPROVEMENTS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.
For primary bibliographic entry see Field 04A.
W72-13964

LOST CREEK LAKE PROJECT, ROGUE RIVER, OREGON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 08D.
W72-13965

WINNEBAGO-BEAN CREEK WATERSHED, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-13966

AQUATIC PLANT CONTROL PROGRAM, HUDSON AND MOHAWK RIVERS, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 04A.
W72-13967

STUART GULCH DAM, IDAHO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Walla Walla, Wash.
For primary bibliographic entry see Field 08D.
W72-13968

PROGRAM STATEMENT FOR THE PROPOSED PROTOTYPE OIL SHALE LEASING PROGRAM (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 03E.
W72-13969

WATER FOR ALABAMA, THE ALABAMA WATER-RESOURCES SPECTRUM--SECOND PROGRESS REPORT,
Geological Survey, University, Ala.
For primary bibliographic entry see Field 05G.
W72-14024

DESIGN AND SITING CRITERIA FOR ONCE--THROUGH COOLING SYSTEMS BASED ON A FIRST-ORDER THERMAL PLUME MODEL,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 05C.
W72-14030

THE CONTROL OF ENVIRONMENT.

112p, North-Holland Publishing Co.: Amsterdam, The Netherlands, and Fleet Academic Editions, Inc., Roslansky, John D. (Edited by), 1971. Pr. $7.50.
Identifiers: Book, *Control, *Environment, Symposium.

The papers presented in this volume were delivered at the 2nd Nobel Conference held at Gustavus Adolphus College on Jan. 12 and 13, 1966. The 5 papers presented are concerned with the effect of the environment on human life and the possibilities of improving life and the conditions in which it develops through the exercise of intelligent control. This book will be of interest to anyone concerned with the relationship between man and his environment.--Copyright 1972, Biological Abstracts, Inc.
W72-14122

MAN AND HIS ENVIRONMENT: CLIMATE,
David M. Gates.
175 P. Harper and Row: New York, N. Y., London, England, 1972. Paper. Pr. $3.25.
Identifiers: Animals, Book, *Climate, *Environment, Plants, *Pollution.

This book is helpful to anyone interested in the effect of weather on himself as well as on other animals and plants. It begins with a basic presentation of fundamental information on weather including temperature and pressure, winds, topographical influences and weather and climate. Among the climatic factors presented are radiation, air temperature, moisture, surface effects and comparison of climates followed by a discussion on various specific climate types and the relationship between climate on various specific climate types and the relationship between climate and man. A presentation is of the interrelationship between plants and animals and their particular climate followed by a discussion on the effects of pollution on climate. The book ends with the author's conclusions and opinions on the future of the environment. Graphs, tables, plates, maps and equations are found throughout.--Copyright 1972, Biological Abstracts, Inc.
W72-14137

07. RESOURCES DATA

7A. Network Design

A REVIEW OF PESTICIDE MONITORING PROGRAMS IN CALIFORNIA.
California State Dept. of Agriculture, Sacramento. Pesticide Advisory Committee.
For primary bibliographic entry see Field 07B.
W72-14043

7B. Data Acquisition

RECENT DEVELOPMENTS OF PHYSICAL INVESTIGATIONS IN BOREHOLES AND WELLS,
Waterloopkundig Laboratorium, Delft (Netherlands).
For primary bibliographic entry see Field 04B.
W72-13727

APPLICATION OF NATURAL ISOTOPES IN GROUND WATER HYDROLOGY,
Groningen Rijksuniversiteit (Netherlands). Physics Lab.
For primary bibliographic entry see Field 02F.
W72-13728

AN ELECTRONIC GROUNDWATER-LEVEL DETECTOR WITH AUTOMATIC OUTPUT REGISTRATION,
Koninklijke-Shell Exploratie en Produktie Laboratorium, Rijswijk (Netherlands). An Electronic Groundwater-Level Detector with Automatic Output Registration,
W. P. Van Rijn, and K. J. Weber.
Geologie en Mijnbouw (Netherlands), Vol 51, No 1, p 137-142, 1972. 5 fig.

Descriptors: *Water levels, *Gages, *Instrumentation, *Piezometers, *Telemetry, Aquifer testing, Monitoring, Data collections.
Identifiers: *Water level recorders.

A simple, robust, electronic groundwater-level detector measures the water level in piezometers with an accuracy of better than plus or minus 1 mm. A series of these instruments can be connected to an automatic digital recording system. Measurements can be performed according to a selected program of measuring times. The reference level at each level detector location is indicated by gaging glasses attached to a system of interconnected liquid-filled tubes. (Knapp-USGS)
W72-13729

EQUIPPING STRUCTURES OF HYDROELECTRIC POWER STATIONS WITH MEASURING DEVICES FOR MONITORING PERCOLATION,
For primary bibliographic entry see Field 08D.
W72-13758

VARIATION OF PRECISION WITH TIME FOR AUTOANALYZER DATA,
Institute of Rural Science, Aberystwyth (Wales). Analytical Lab.
N. T. Faithfull.
Laboratory Practice, Vol 21, No 4, p 245-247, 268, April 1972. 3 fig, 2 tab, 5 ref.

Descriptors: *Automation, *Nitrogen, *Potassium, *Colorimetry, Flame photometry, Evaluation, Laboratory equipment, Pump testing, Performance, Methodology, Testing procedures, Quality control.
Identifiers: AutoAnalyzers, *Peristaltic pumps, Precision.

The time allowed for the peristaltic pump of an AutoAnalyzer to pump reagents before sampling commences is shown to affect the precision of results. For the colorimetric determination of nitrogen, about 40 minutes warmup is needed, and for flame-photometric determination of potassium, about 23 minutes. The adequacy of assessing the precision of AutoAnalyzer data in terms of standard deviations was examined and its validity shown to depend on a normal distribution of results. It is important that a valid standard deviation figure is used. Histograms from repeatedly analyzed nitrogen and potassium standards are presented. (Mortland-Battelle)
W72-13763

ON CALCULATION OF THE AREAS OF OFF--CHART CHROMATOGRAPHIC PEAKS USING DATA OBTAINED WITH THE AID OF INTEGRATORS,
Akademiya Nauk SSSR, Moscow. Institut Organicheskoi Khimii.
B. Rudenko.
Journal of Chromatographic Science, Vol 10, No 4, p 230-232, April 1972. 1 fig, 2 tab, 5 ref.

Descriptors: *Mathematical studies, *Chromatography, Automation, Equations, Approximation method, Pollutant identification.
Identifiers: *Chromatographic peaks, Gaussian curves, Integrators, Errors, Gas liquid chromatography, Chromatograms, Accuracy.

In order to determine the full areas of 'off-chart' chromatographic peaks, a new mathematical method has been introduced based on the Gaussian curve approximation to the peak height. This method uses the area of the resulting curvilinear trapezium and its height and width on top. These parameters can be registered by use of an integrator and verified by computation. The method can be applied for quantitation of chromatograms and gives an accuracy usually obtained in quantitative gas-liquid chromatographic analysis. (Mackan-Battelle)
W72-13769

ON-LINE COMPUTER-CONTROLLED ELECTRICAL DETECTION IN SPARK SOURCE MASS SPECTROMETRY,
Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.
G. H. Morrison, B. N. Colby, and J. R. Roth.
Analytical Chemistry, Vol 44, No 7, p 1203-1206, June 1972. 3 fig, 10 ref.

Descriptors: *Computers, *Instrumentation, *Methodology, *Automation, *Mass spectrometry, Trace elements, Pollutant identification, Laboratory equipment, Data processing, Data transmission, Data collections.
Identifiers: *Spark source mass spectrometry, Chemical interference, Errors, Precision, Detection, Accuracy.

The design and operation of a versatile on-line computer controlled electrical detection system are described for use in spark source mass spectrometry. The system utilizes a PDP-11/20 dedicated, on-line computer capable of controlling the magnet and electrostatic analyzer of a mass spectrometer in either a scanning or peak switching mode. Since the peak switching mode provides a more precise and accurate method for the determination of trace elements, it has been emphasized in this study. In order to determine how precisely measurements are made with the described system, a sample of 99.9 percent pure iron was analyzed for its mass 58 isotope. For 10 sets of ten measurements, the mean precision (instrumental error) for the Fe-58 isotope was 2.3 percent relative standard deviation. Advantages of the system include: (1) It is convenient to check for possible mass interference with the on-line computer system which might be missed during analysis using a manual switcher; (2) The computer can be programmed to calculate and set a given electrostatic analyzer voltage so that a given mass can be analyzed by the computer even though the peak is not large enough to be observed on the oscilloscope display during the computer scan of the electrostatic analyzer voltage; and (3) The speed of acquisition and reduction of data permits almost immediate evaluation of results. (Long-Battelle)
W72-13770

SEMIINTEGRAL ELECTROANALYSIS: THEORY AND VERIFICATION,
Trent Univ., Peterborough (Ontario).
For primary bibliographic entry see Field 02K.
W72-13791

A NEW LIGHT TRAP FOR PLANKTON,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 05A.
W72-13797

VERSATILE COLORIMETRIC COULOMETER,
Honeywell Research Center, Hopkins, Minn.
For primary bibliographic entry see Field 02K.
W72-13802

PRELIMINARY REPORT ON TECHNIQUES FOR MARINE MONITORING SYSTEMS,
University of Southern California, Los Angeles. Dept. of Biological Sciences.
For primary bibliographic entry see Field 05B.
W72-13850

ESTIMATING THE WETTING OF WALLS BY DRIVING RAIN (OB OTSENKE UVLAZHENIYA STEN PRI KOSYKH DOZHYDAKH),
Main Geophysical Observatory, Leningrad (USSR).
Ts. A. Shver.
In: Prikladnaya klimatologiya; Glavnaya Geofizicheskaya Observatoriya, Trudy No 246, p 122-129, Leningrad, 1969. 2 fig, 3 tab, 7 ref.

Descriptors: *Precipitation (Atmospheric), *Rainfall, *Impact (Rainfall), *Wetting, *Walls, Surfaces, Structures, Buildings, Winds, Wind velocity, Annual, Evaluation.
Identifiers: *European USSR, *Barents Sea, *Baltic Sea, *Gulf of Finland, *Driving rain, Wind-driven precipitation, Wind direction, Wind rose.

The Lacy-Shellard index of driving rain is found too inaccurate becasue it ignores wind direction and relies only on mean annual precipitation and mean annual wind speed. A relative measure of the wetting of walls is provided by a more refined driving-rain index, which is the product of total precipitation and frequency of wind speeds of more than 5 m/sec. A study of maps of the driving-rain index for 158 stations in the European USSR reveals that 30% to 40% of total precipitation strikes walls and other vertical surfaces north of latitute 55 deg N, but that the percentage rises to about 70% along the coasts of the Barents Sea, the Baltic Sea, and the Gulf of Finland. The frequency of wind directions on rainy days can be used to determine the amount of precipitation striking walls of varying exposure. (Josefson-USGS)
W72-13855

PROBLEMS IN HYDROLOGIC INSTRUMENTATION (VOPROSY GIDROLOGICHESKOGO PRIBOROSTROYENIYA).

Gosudarstvennyy Gidrologicheskiy Institut, Trudy No 189, Leningrad, 1971. 144 p.

Descriptors: *Hydrology, *Hydrometry, *Instrumentation, *Measurement, *Analytical techniques, Automation, Control, Regulation, Telemetry, Computers, Gages, Soil moisture meters, Water level recorders, Equipment, Hydrographs, Discharge (Water), Runoff, Physical properties, Conferences, Foreign research.
Identifiers: *USSR, Hydrometric stations.

This collection of 15 papers provides information on Soviet hydrologic instruments and on technical procedures used in water-resources investigations. Methods are given for determining optimal frequency of discharge measurements in gaging streams and moisture content of soils through analysis of terrestrial gamma radiation. Instruments described include the SNM-11 neutron soil-moisture meter, the 'Valday-1' and 'Valday-2' automatic digital temperature gages, the 'Valday' automatic water-level recorder, the GR-97 telemetering water-level gage, and the M-100 radioisotope snow gage. A brief review is given of selected reports presented at the International Symposium on Hydrometry held in Koblenz, Germany between September 19 and 24 1970, and devoted to new techniques and instruments for hydrologic investigations. Intended primarily to serve practicing scientists, methodologists, and engineers interested in various aspects of instrumentation, the text will also prove valuable to hydrometeorologists, and to teachers, undergraduates, and graduates at higher academic institutes. (Jesefson-USGS)
W72-13859

A RADIATION MOLE FLOW-MOISTURE METER,
A. S. Kareev, B. Ya., Minkov, and P. S. Bespalyi.
Available from NTIS, Springfield, Va 22151 as PB-209 058-T, for $3.00 paper copy; 95 cents microfiche. National Tillage Machinery Laboratory Translation, April 1972. 7 p, 5 fig, 2 tab, 4 ref. Translated from Mekhan. i Elektrif. Sots. Sel. Khoz., No 1, 1972.

Descriptors: *Soil moisture, *Moisture meters, *Forestry, *Testing procedures, *Soil tests, Forest soils, Density, Energy, Instrumentation, Measurement, Equations, Data collections.

A mole plow radiation moisture meter was developed for use in measurement of soil conditions in areas where gross sampling of the soil is required, as in tree plantings. An equation was developed to describe the draft force on the mole knife. The radiation mole plow moisture meter was mounted on tractors up to 3 tons, in a cylindrical or narrow slit-shaped mole. Radiation studies of the moisture and density meters were conducted both in the field and laboratory conditions. Energy studies were conducted at different depths to determine the required roughness of working surfaces, speed of movement of the equipment, and to study the physical-mechanical properties of the soil. The resistance of the soil to cutting increased with increases of speed, depth of cutting, and width of cut. (Woodard-USGS)
W72-13862

USE OF ZAYTSEV METHOD FOR DETERMINING THE WATER CONTENT OF FOGS IN CHAMBERS,
A. F. Mumanenko.
Available from NTIS, Springfield, Va 22151 as AD-741-521, for $3.00 paper copy; 95 cents microfiche. U.S. Army Foreign Science and Technology Center Technical Translation, FSTC-HT-23-108-71, October 27, 1971. 8 p, 4 fig, 1 tab, 9 ref.

Descriptors: *Cloud physics, *Fog, *Atmospheric physics, *Meteorology, Meteoric water, Measurement, Condensation, Water vapor, Analytical techniques, Water equivalent, Precipitation (Atmospheric).

The structure of clouds and fogs were studied including the drop size and water content (i.e., the mass of water in the liquid or solid phase, occurring per unit of colume of air). Of all the currently existing methods of measuring water content, the simplest and most widely used is the method of V.A. Zaytsev. In this method, the air to be examined, together with the particles of cloud or fog is directed in a narrow stream at rather high speed into a strip of filter paper covered with dye and placed in a special holder. The air flows freely through the holder, but the drops are deposited by inertia on the paper and saturate it. A spot appears on the paper whose average diameter characterizes the magnitude of the water content. (Woodard-USGS)
W72-13863

APPARATUS FOR MEASURING PROPERTIES OF A FLUID BODY FROM AN AIRBORNE VEHICLE,
Buzzards Bay Corp., Marion, Mass. (Assignee).
S. A. Francis.
U.S. Patent No 3,552,205, 4 p, 7 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 882, No 1, p 83, January 5, 1971.

Descriptors: *Patents, Water properties, *Instrumentation, *Measurement, *Bathythermographs, Depth, *Water temperature, *Sea water.
Identifiers: *Airborne instrumentation, *Thermistors.

An airborne vehicle (helicopter) launches or deploys a probe which contains a property sensing element such as a thermistor and sea electrodes for closing a circuit by means of conductive sea water. The sensing element and sea electrodes are connected by means of a three-wire conductor to a measuring bridge circuit located aboard the aircraft. The resistance in the sensing element varies as a function of the water property. The bridge measuring circuit is associated with a servosystem operating a recording system to produce a record of the measurement as a function of the depth of the water. (Sinha-OEIS)
W72-13876

SIMULTANEOUS DETERMINATION OF SHORT-PERIOD PHOTOSYNTHESIS AND EVAPOTRANSPIRATION,
Nebraska Univ., Lincoln. Dept. of Horticulture and Forestry.
For primary bibliographic entry see Field 03F.
W72-14009

A REVIEW OF PESTICIDE MONITORING PROGRAMS IN CALIFORNIA.
California State Dept. of Agriculture, Sacramento. Pesticide Advisory Committee.

California State Water Resources Control Board, Sacramento, February 1971. 80 p, 6 tab, 61 ref.

Descriptors: *Pesticides, *Monitoring, *California, *Data collections, Water quality, Water pollution, Municipal wastes, Industrial wastes, Water quality control, Heavy metals, Water pollution control.
Identifiers: *Pesticide monitoring.

Recognizing that pesticides are a significant form of water pollution, California formed a Pesticide Advisory Committee to serve the State Department of Agriculture. The Pesticide Advisory Committee early in its existence recognized that a comprehensive study of the current problem of pesticides must be made if a sensible program of control is to be set up. This has led to the statewide review of pesticide monitoring programs. A significant amount of pesticides were found in municipal and industrial wastes, and the present monitoring system was fragmented and uncoordinated. Agricultural runoff was also a significant contributor to the state's pesticides problems and the use of highly toxic organo-phosphate pesticides would contribute greatly to the problem. Refuse dumps were inadequately monitored for pesticide pollution, and heavy metals monitoring was inadequate. It is recommended that the State set up a comprehensive, coordinated system to monitor pesticides and trends in pesticide concentrations. Municipal wastes are especially seen as an area which had previously escaped monitoring and it is felt that this should be remedied. (Poertner)
W72-14043

INDIANA WATER QUALITY, 1969, MONITOR STATION RECORDS--RIVERS AND STREAMS.
Indiana State Board of Health, Indianapolis; and Indiana Stream Pollution Control Board, Indianapolis.

1970. 139 P, 3 FIG, 108 TAB.

Descriptors: *On-site data collections, *Basic data collections, *Indiana, *Water quality, *Water sampling, Water pollution, Rivers, Streams, Alkylbenzene sulfonates, Alkalinity, Biochemical oxygen demand, Chlorides, Coliforms, Color, Dissolved oxygen, Hardness (Water), Nitrates, Odor, pH, Phosphates, Suspended solids, Turbidity.

This is the 11th annual compilation on water quality data for the State of Indiana. Using 82 data collecting stations on Indiana streams, the Ohio River and Lake Michigan, the following water quality parameters are tabulated: (1) ABS, (2) alkalinity (tital), (3) BOD, (4) chlorides, (5) coliform, (6) color, (7) dissolved oxygen, (8) hardness, (9) nitrates, (10) odor, (11) pH, (12) phosphates, (13) specific conductance, (14) suspended matter, and volatile suspended matter, (15) total residues, and (16) turbidity. The objective of the program is six-fold, including (1) the determination of characteristics of pollutants in Indiana waters, (2) the indication of pollution sources in Indiana, and (3) to compile background data on wastes for use in abatement programs. Criteria for locating the sampling stations used in the study are given. Stations were located on waters used for municipal, industrial, agricultural and recreational purposes. Their proximity to sources of pollution and state boundaries also influenced the selection of locations for these stations. (Poertner)
W72-14045

WEST VIRGINIA WATER QUALITY NETWORK.
West Virginia Dept. of Natural Resources, Charleston. Div. of Water Resources.

1971. 149 P, 1 FIG, 64 TAB.

Descriptors: *West Virginia, *Water quality, *Water sampling, *Data collections, Water pollution, Rivers, Coliforms, Bio-chemical oxygen demand, Alkalinity, Heavy metals, pH, Odor, Color, Chlorides, Sulfates, Turbidity, Analytical techniques, Networks.

West Virginia set up a Water Quality Network to obtain data on water quality throughout the state. Specific objectives of their program are: (1) establish water quality trends; (2) warn of detrimental changes in water quality, (3) obtain data useful to municipal, industrial, agricultural, recreational and civic interests; and (4) bracket waste discharges and determine their types and effects upon the stream under various conditions. Over 30 parameters were included in this study. Sampling stations were selected so that data could be obtained on all major streams entering and leaving the state. The individual stations were set up near existing U. S. Geological streamflow gaging stations. Included is a copy of the West Virginia water quality regulations, amended to 1969. (Poertner)
W72-14048

IMPROVED THERMOCOUPLE PSYCHROMETER FOR THE MEASUREMENT OF PLANT AND SOIL WATER POTENTIAL: II. OPERATION AND CALIBRATION,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
B. D. Millar.
J Exp Bot. 22 (73): 891-905. Illus. 1971.
Identifiers: Calibration, *Measurement, Operation, *Psychrometer measurement, Soils, Temperature, *Water potential.

The operation characteristics (the Peltier cooling current i and the cooling period tc), the range of measurement of water potential, the calibration sensitivity, and the accuracy are evaluated for an improved psychrometer and compared with data in the literature, and with a recent theory. It has been found to agree fairly well with the predictions of theory. A maximum range of 0 to about -13,000 J/kg is obtainable with the improved psychrometer. This is nearly twice that previously reported for a Spanner-type psychrometer. The experimental calibration sensitivities C's increase with increasing water potential, cooling period, and temperature and, with tc = 60 s, are in general larger than the theoretical values at high water potentials but less than the theoretical values at low water potentials. They are mostly larger than those reported by Monteith and Owen but about the same as those of Lang and Trickett. The accuracy of the improved psychrometer is significantly greater than that previously reported for a Spanner-type psychrometer. While the theory predicts a linear relationship between water potential and peak output, the observed calibration curves are non-linear and vary between psychrometers. Because of these discrepancies between observation and theory, calibration of each psychrometer is necessary.--Copyright 1972, Biological Abstracts, Inc.
W72-14120

THE USE OF AERIAL PHOTOS IN PEDOLOGICAL CARTOGRAPHY OF THE AREA OF TRANSITION BETWEEN THE TROPICAL FOREST AND SAVANNA IN THE CENTRAL IVORY COAST,
Ghent Rijksuniversiteit (Belgium). Laboratorium voor Fysiologische Scheikunde.
W. Verheye.
Natuurwetensch Tijdschr. 52 (4-8): p 137-152. Illus. 1970 (1971). (French summary).
Identifiers: *Aerial photography, Cartography, Forest, *Ivory Coast, *Pedological cartography, Savanna, *Soils, Transition, Tropical, Vegetation.

A close relationship between the natural vegetation and soils exists in the granitic landscape covering large areas in the zone of transition between the dense tropical forest and the savanna in the central Ivory Coast. The key factor at the base of this relationship is the water-retaining capacity. The available moisture in the profile has a direct influence on the natural vegetation of the surface, especially in determining the rapidity with which forest regeneration occurs following clearing. The modal or hardened modified ferrallitic soils located on the plateaus retain enough

moisture, even during the dry season, to allow rapid establishment of a secondary forest. However, the colluvial modified ferrallitic soils with a sandy texture, which are located along the slopes, have a marked water deficiency during certain periods of the year causing the presence of a grassy savanna on these soils. As for the hydromorphous colluvial modified ferrallitic soils located in the humid bottom lands, they are always covered with a littoral forest; the extension of this specific type of vegetation strongly coincides with the hydromorphous soil zones.--Copyright 1972, Biological Abstracts, Inc.
W72-14129

AN INSTRUMENT FOR CONTINUOUS RECORDING OF NATURAL EVAPORATION,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
I. C. McIlroy.
Agric Meteorol. 9 (1/2): 93-100. Illus. 1971.
Identifiers: Crops, *Evaporation, *Instrumentation, Recording, Sensing.

Direct recording of evaporation from crops or other natural surfaces, continuously over long periods, has till now been practicable only by means of elaborate weighed lysimeters or possibly, for large enough uniform sites, by sophisticated eddy correlation techniques. The present instrument adapts the well-known Bowen-ratio method so as to combine the sensing and computing functions into 1 relatively simple package. It utilizes a servo-balanced bridge technique to give a continuous output proportional to the evaporation rate at a low height above the surface, and suitable for conventional recorders or integrators. Trials with an early pilot-model have shown a very satisfactory daytime performance at night.--Copyright 1972, Biological Abstracts, Inc.
W72-14136

WATER PROFILE FLUCTUATIONS RECORDED BENEATH SOME FORAGE PLANTS DURING THE DRY SEASON USING THE NEUTRON METHOD, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Abidjan (Ivory Coast). Centre d-Adiopodoume.
J. C. Talineau, and P. A. Lespinat.
Cah O. R. S. T. O. M. (Off Rech Sci Tech Outre-Mer) Ser Biol. 15. 3-19. Illus. 1971. English summary.
Identifiers: *Neutron moisture gage, Centrosema-Pubescens-D, Cynodon-Plectostachyon-M, Dry season, *Forage plants, *Ivory Coast, Panicum-Maximum-M, Pennisetum-Purpureum-M, Plants, Recorded, Stylosanthes-Gracilis-D, Tripsacum-Laxum-M, *Water profiles.

A neutron moisture gauge has been used at Adiopodoume (southern Ivory Coast) to find the profile of the field at capacity and the study of the behavior of the following forage plants during the dry season: Panicum maximum, Pennisetum purpureum, Tripsacum laxum, Cynodon plectostachyon; Stylosanthes gracilis, Centrosema pubescens. The experimental field (tertiary sand) was homogeneous, making possible a single calibration curve for the moisture gauge. Regular recording of the neutron profiles provided a means of comparing the water consumption of the different plants in the layer 0-100 cm. The influence of the available water capacity of the soil and also indicated the root system of plants separate treatments of grasses and leguminous plants.--Copyright 1972, Biological Abstracts, Inc.
W72-14138

PSYCHROMETRIC APPARATUS FOR BOWEN-RATIO DETERMINATION OVER FORESTS,
British Columbia Univ., Vancouver. Dept. of Soil Science.
T. A. Black, and K. G. McNaughton.
Boundary-Layer Meterorol. 2 (2): 246-254. Illus. 1971.
Identifiers: *Bowen-ratio determination, *Douglas fir, Fir-G, Forests, *Psychrometric apparatus.

The psychrometric apparatus design for Bowen ratio determination reported previously by Sargeant and Tanner was modified and a new apparatus built. Modification of the intake design improved the symmetry and rigidity of the sensor mounting. Wet- and dry-bulb differences were measured with an error less than 0.01 degrees C over a vertical distance of 1 m. Continuous measurements of the Bowen ratio over a 7.8-m Douglas fir forest were made for 6 wk. An example of the energy balance for the forest for 1 day using this equipment is reported.--Copyright 1972, Biological Abstracts, Inc.
W72-14184

MECHANICAL BALANCE: ELECTRICAL READOUT WEIGHING LYSIMETER,
Atmospheric Environment Service, Toronto (Ontario).
E. I. Mukammal, G. A. McKay, and V. R. Turner.
Boundary-Layer Meterorol. 2 (2): 207-217. Illus. Map. 1971.
Identifiers: Electrical readout, *Lysimeters, *Mechanical balance, Percolation, *Runoff measurement.

As part of the research program of the Atmospheric Environment Service, a large, sensitive weighing lysimeter was constructed on the Atmospheric Environment Service research site north of Toronto. Features of the instrument include: measurement of runoff, percolation, drainage of water held in tension, addition of water from below during dry conditions, equalization of soil temperature profile inside with that outside the lysimeter, humidity control to eliminate condensation, low area of discontinuity at the rim to reduce edge effects, and quasimonolith filling. This paper describes the construction and installation of the lysimeter, the problems encountered and some infrequently considered sources of error.--Copyright 1972, Biological Abstracts, Inc.
W72-14185

AN IMPROVED SOIL WATER FLUX SENSOR,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Research.
G. F. Byrne.
Agric Meteorol. 9 (1/2): 101-104. Illus. 1971.
Identifiers: Flow, *Measurement, Rate, *Sensor, *Soil-water flux.

The design, construction, and calibration of a sensor which can be used to measure water flow rates through soil of 10-3 cm/sec is described.--Copyright 1972, Biological Abstracts, Inc.
W72-14192

A HAND-AUGERING METHOD OF INSTALLING ACCESS TUBING FOR NEUTRON MOISTURE METERS,
Forestry Office, Atherton (Australia).
D. A. Gilmour.
Aust For Res. 5 (3): 33-38. Illus. 1971.
Identifiers: Auger, Boring, Equipment, *Meters. *Neutron moisture meters, Sampling, *Soils, Tubing.

Equipment is described for preparing holes for the installation of neutron moisture meter access tubing. It can be man-handled into areas inaccessible to vehicles and provides a versatility not found in conventional techniques. The main feature is the provision of easily exchangeable auger heads. Boring is carried out in 10 cm sections and the soil is retained for subsequent laboratory analyses so that field calibration of the neutron probe can be accomplished.--Copyright 1972, Biological Abstracts, Inc.
W72-14194

7C. Evaluation, Processing and Publication

DIGITAL SIMULATION OF THUNDERSTORM RAINFALL,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 02B.
W72-13634

FLOODING ALONG THE RIO PIEDRAS IN THE SAN JUAN AREA, PUERTO RICO,
Geological Survey of Puerto Rico, San Juan.
W. J. Haire.
Geological Survey Hydrologic Investigations Map Series No 1, 1972. 2 sheets, 2 fig, 1 map, 1 tab, 1 ref.

Descriptors: *Floods, *Flood damage, *Flood plains, *Flood profiles, *Puerto Rico, Regional flood, Flood forecasting, Flood control, Historic floods, Peak discharge, Flood frequency.
Identifiers: *Rio Piedras (P.R.), San Juan (P.R.).

This 2-sheet hydrologic atlas describes flooding along the Rio Piedras in the San Juan area, Puerto Rico, to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, tables, and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, run off, historical flood heights and other technical data. The only floods for which elevation data are available occurred on June 17, 1970 and October 6, 1970. The larger of the two was the June flood. Storm runoff from the upper basin caused flooding in the University Gardens urbanization with a peak water level of 21 meters. The average frequency of occurrence for the peak discharge (10,000 cubic feet per second) of the flood of June 17 is 8 years. (Woodard-USGS)
W72-13714

GROUND WATER IN KEARNY COUNTY, SOUTHWESTERN KANSAS,
Geological Survey, Washington, D.C.
E. D. Gutentag, D. H. Lobmeyer, and H. E. McGovern.
Geological Survey Hydrologic Investigations Atlas HA-416, 1972. 2 sheets, 14 fig, 5 tab, 13 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Water wells, *Water quality, *Kansas, Water yield, Aquifer characteristics, Pumping, Drawdown, Water utilization, Irrigation, Groundwater recharge, Specific capacity, Maps, Curves, Hydrologic data.
Identifiers: *Kearny County (Kans).

This 2-sheet hydrologic atlas uses a text and 19 illustrations (maps, tables, and curves) to describe groundwater hydrology in Kearny County, Kansas. Tertiary and Quaternary deposits underlie most of Kearny County and range in thickness from a few feet to about 500 feet. The increasing use of groundwater for irrigation has resulted in a decline in water levels and a gradual loss of water in storage. Water-level declines from 1940 to 1968 ranged from zero to more than 30 feet. The decline is compared to the decline in thickness of saturated material. In the north-central part of the county, a 30% decline in the saturated thickness has resulted in a significant reduction in well yields. In the area east of the fault, saturated thickness is great and declines are generally less than 10%. Yields from individual wells may be as much as 2,400 gpm; some battery-well systems have produced more than 4,000 gpm. Water in the alluvial aquifer may be a calcium bicarbonate or a calcium sodium sulfate type and is very hard. Water in the sandstone aquifer is a sodium bicarbonate type and is hard. (Woodard-USGS)
W72-13715

GROUND-WATER RESOURCES OF MCLEAN COUNTY, WEST-CENTRAL NORTH DAKOTA,
Geological Survey, Washington, D.C.
R. L. Klausing.
Available from USGS, Washington, DC 20242- Price $0.75. Geological Survey Hydrologic Investigations Atlas HA-475, 1972. 1 sheet, 1 fig, 1 map, 1 tab, 6 ref.

Descriptors: *Groundwater resources, *Water supply, *Water yield, *Water quality, *North Dakota, Aquifer characteristics, Water wells, Withdrawal, Water utilization, Maps, Curves, Hydrologic data, Water analysis, Chemical analysis, Water resources development.
Identifiers: *McLean County (N. Dak).

This one-sheet hydrologic atlas describes the occurrence and movement of groundwater in McLean County, N. Dak., including the sources and areas of recharge and discharge, the potential yields of wells tapping the major aquifers, and the chemical quality of the groundwater. Important aquifers occur both in the glacial drift and in the underlying bedrock formations. The major glacial-drift aquifers generally will yield more than 50 gpm to individual wells and in places will yield more than 1,000 gpm. Three bedrock units--the Fort Union Formation, Hell Creek Formation, and Fox Hills Sandstone--supply water to wells in McLean County. The most productive bedrock aquifers consist of sandstone and lignite beds. Wells tapping these aquifers can be expected to yield from 2 to 100 gpm. Water from the bedrock aquifers is predominantly soft and is a sodium bicarbonate type. Water from the glacial-drift aquifers generally is harder but less saline and of better quality than water from the bedrock aquifers. (Woodard-USGS)
W72-13716

A COMPUTERIZED SYSTEM FOR STORING, RETRIEVING, AND CORRELATING NMR DATA,
Hercules Research Center, Wilmington, Del.
H. Skolnik.
Applied Spectroscopy, Vol 26, No 2, p 173-182, March/April 1972. 13 tab, 6 ref.

Descriptors: *Indexing, *Nuclear magnetic resonance, *Molecular structure, Spectroscopy, Computers, Computer programs, Organic compounds, Data processing, Automation, Data storage and retrieval, Documentation, Information retrieval.
Identifiers: *Chemical shifts, Protons.

The importance and value of nuclear magnetic resonance arise from the unique and characteristic chemical shifts of protons in organic compounds. Although the resultant shift spectrum is primarily due to the protons in each proton group, it is also modified by other nuclei in the molecule. Because a meaningful correlative index of chemical shift values is essential for effective use of NMR data, a new method based on a linear notation system has been developed. This method uses symbols to express various C-H combinations and other H-R combinations. The notation of each compound and the shifts of each proton group constitute input for a computer which processes the data by a permutation or wrap around program yielding as many index entries as there are proton groups (with shift data) in each molecule. An additional program yields an output, by increasing value, of the chemical shifts of any proton group relative to its neighboring groups. This method not only provides for more effective data handling but eliminates manual indexing and includes more than just a few of the atoms of the full structure, both of which are cited as disadvantages of the Sadtler Chemical Index and Varian Functional Group Index. (Mackan-Battelle)
W72-13808

A SURVEY OF INDEXING AND ABSTRACTING SERVICES FOR WATER RESOURCES ENGINEERING,
Maryland Univ., College Park. Water Research Center.
For primary bibliographic entry see Field 10B.
W72-13820

EVALUATION OF A DETERMINISTIC MODEL FOR PREDICTING WATER YIELDS FROM SMALL AGRICULTURAL WATERSHEDS IN VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Research Div.
For primary bibliographic entry see Field 02A.
W72-13824

SURFACE WATER SUPPLY OF THE UNITED STATES, 1961-65, PART 1. NORTH ATLANTIC SLOPE BASINS--VOLUME 2. BASINS FROM NEW YORK TO DELAWARE.
Geological Survey, Washington, D.C.

Geological Survey Water-Supply Paper 1902, 1970. 924 p, 1 fig, 1 plate.

Descriptors: *Surface waters, *Hydrologic data, *Basic data collections, *New York, *Delaware, Streamflow, Flow measurements, Stream gages, Gaging stations, Flow rates, Crest-stage gages, Discharge measurement, Low flow, Peak discharge, Average flow, Lakes, Reservoirs, Water levels, Reservoir operation.
Identifiers: *North Atlantic Slope Basins (NY to Del).

This volume of surface water data for the North Atlantic Slope Basins from New York to Delaware is one of a series of 37 reports presenting records of stage, discharge, and content of streams, lakes, and reservoirs in the United States during the 1961-65 water years. The tables of data include a description of the gaging station, and daily, monthly, and yearly discharges of the stream. The description of the station gives the location, drainage area, records available, type and history of gage, average discharge, extremes of discharge, and general remarks. For most gaging stations on lakes and reservoirs a description of the station and a monthly summary table of stage and contents are given. Data for partial-record stations include measurements at low-flow partial-record stations and annual maximum stage and discharge at crest-stage stations. (Woodard-USGS)
W72-13827

ATLANTIC CONTINENTAL SHELF AND SLOPE OF THE UNITED STATES-PETROLOGY OF THE SAND FRACTION OF SEDIMENTS, NORTHERN NEW JERSEY TO SOUTHERN FLORIDA,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02J.
W72-13830

PERMAFROST IN CANADA.
Geological Survey of Canada, Ottawa (Ontario).

Available from Geol. Survey of Canada and Div. of Building Research, Ottawa-$0.50. Canada Geological Survey Map 1246A-Division of Building Research Publication NRC 9769, 1969 (revised). 1 sheet, 1 map, 1 tab, 65 ref.

Descriptors: *Permafrost, *Canada, *Maps, *Data collections, Frozen ground, Cold regions, Climatology, Temperature, Soil properties, Soil moisture.

This one-sheet atlas describes the distribution and occurrence of permafrost in Canada. The permafrost region is divided into two zones-continuous and discontinuous. The division between these zones is the 23 degree F isotherm of mean annual ground temperature measured just below the zone of seasonal variation (level of zero annual amplitude). In the discontinuous zone, there are areas and layers of unfrozen ground. In the continuous zone, permafrost occurs everywhere beneath the ground surface except possibly in newly deposited unconsolidated sediments where the climate has just begun to impose its influence on the ground thermal regime. The thickness of permafrost varies from about 200 feet at the southern limit of the continuous zone to more than 1000 feet in the northern part of the zone. The active layer, which freezes in winter and thaws in summer, generally varies in thickness from about 1 1/2 to 3 feet and usually extends to the permafrost table. The temperature of the permafrost at the level of zero annual amplitude ranges from 25 F in the south to about 5 F in the extreme north. (Woodard-USGS)
W72-13831

FOUR-DIMENSIONAL WORLD-WIDE ATMOSPHERIC MODELS (SURFACE TO 25 KM ALTITUDE),
Allied Research Associates, Inc., Baltimore, Md. Baltimore Div.
For primary bibliographic entry see Field 02B.
W72-13843

THE RIVER BASIN MODEL: THE SOCIAL SCIENCE LABORATORY.
Environmetrics, Inc., Washington, D. C.
For primary bibliographic entry see Field 06A.
W72-13929

DIGITAL COMPUTER MODELING OF LIMESTONE GROUNDWATER SYSTEMS,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 02F.
W72-14001

STREAMFLOW SYNTHESIS -- A CASE STUDY,
Nevada Univ., Reno. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-14005

THEORY OF STOCHASTIC MODELING OF WATERSHED SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W72-14007

GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1972,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 04B.
W72-14023

RECORDS OF WELLS IN HARRIS COUNTY, TEXAS, 1892-1972,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 04B.
W72-14027

DEVELOPMENT OF GROUND WATER IN THE EL PASO DISTRICT, TEXAS, 1963-70,
Geological Survey, El Paso, Tex.
For primary bibliographic entry see Field 02F.
W72-14029

08. ENGINEERING WORKS

8A. Structures

TECHNIQUES FOR PREVENTING DIFFERENTIAL-PRESSURE STICKING OF DRILL PIPE,
Continental Oil Co., Ponca City, Okla.
For primary bibliographic entry see Field 08C.
W72-13618

PLAN THE MUD PROGRAM TO REDUCE EXPLORATION COST,
National Lead Co., Houston, Tex. Baroid Div.
G. R. Gray.
Western Miner, Vol 44, No 4, April 1971, p 36-44. 8 ref.

Descriptors: *Drilling fluids, Rotary drilling, *Exploration, Drilling, Mud, Control, Subsurface investigations.
Identifiers: *Exploratory drilling, Mud control, Diamond drilling.

A well-planned exploratory-drilling program must consider such factors as: the primary objective, water supply, lithology, drill site, drilling equipment, climate, and manpower. The desired end-product is maximum information at minimum cost. Examples are cited of the close relationship between the drilling fluid and other factors affecting the success of exploratory drilling programs. (Campbell-NWWA)
W72-13620

WHICH LOST-CIRCULATION MATERIALS TO USE ... AND HOW TO USE THEM,
Magnet Cove Barium Corp., Houston, Tex.
For primary bibliographic entry see Field 08G.
W72-13621

SQUEEZE SLURRIES FOR LOST CIRCULATION CONTROL,
Pan American Petroleum Corp., Tulsa, Okla.
For primary bibliographic entry see Field 08G.
W72-13622

A NEW LOOK AT LOST CIRCULATION,
Pan American Petroleum Corp., Tulsa, Okla.
For primary bibliographic entry see Field 08G.
W72-13623

CHEMICAL REMOVAL OF DRILLED SOLIDS,
Pan American Petroleum Corp., Tulsa, Okla.
For primary bibliographic entry see Field 08G.
W72-13624

DESIGN AND OPERATION OF JET-BIT PROGRAMS FOR MAXIMUM HYDRAULIC HORSEPOWER, IMPACT FORCE OR JET VELOCITY,
Gulf Research and Development Co., Pittsburgh, Pa.
For primary bibliographic entry see Field 08C.
W72-13626

WHY ROCK-BIT BEARINGS FAIL,
For primary bibliographic entry see Field 08G.
W72-13632

NEW PIPE CONFIGURATION REDUCES WALL STICKING,
Engineering Enterprises, Inc., Houston, Tex.
F. K. Fox.
World Oil, p 83-87, Dec. 1960. 6 fig.

Descriptors: *Rotary drilling, Drilling fluids, Hydraulics, Drilling equipment, Bore holes, Drilling, Pipes, Wells.
Identifiers: *Differential pressure sticking, Drill collars, Washover operations.

If mud pressure is not uniformly distributed around drill pipe in a borehole, an unbalanced hydrostatic condition exists. This results in the pipe being held against the wall of the hole by the unequalized hydraulic pressure. It is very common for this force to be in the range of 5,000 to 15,000 pounds per foot of pipe stuck. A design which greatly reduces the occurrence of stuck pipe by equalizing hydraulic pressure around the pipe is studied; this design employs several spiral grooves down the length of the collar. The theory is that if the contact surface of the collars is broken repeatedly and at short intervals down the body of the drill collar, then the hydrostatic pressure of the mud column will be equalized around a large percentage of the drill collar's length. (Campbell-NWWA)
W72-13633

RIPRAPPED BASINS FOR CULVERT OUTFALLS,
Colorado State Univ., Fort Collins; and Idaho Univ., Moscow.
M. A. Stevens, D. B. Simons, and F. J. Watts.
Highway Research Record, No 373, p 24-38, 1971. 11 fig, 9 ref.

Descriptors: *Basins, *Scour, *Culverts, *Hydraulic design, *Erosion, *Erosion control, Riprap, Hydraulic structures, Model tests, Rocks, Discharge (Water), Tailwater, Flow rates, Aprons, Hydraulic models, Slopes, Closed conduits.
Identifiers: *Outfalls, Holes, Erosion strength, Rectangular conduits.

A method for designing rock-lined basins for culvert outfalls was developed from model test data. The recommended rock-lined basins are suitable for single-barrel or multibarrel installations for both circular and rectangular outlets. The culvert flows considered are for mildly sloping or horizontal culverts with drawdown at the outlet. Alternative rock basin designs, based on the size of available rock, are provided. If the characteristics of the available rock will not prevent scour at the outlet, then a scoured basin design may become feasible. Cost comparisons between the most economical rock basin design and concrete and fabricated metal outlet structures should be made before selecting the outlet basin design. Design aids for riprapped culvert outlet basins were developed from model tests because the 3-dimensional flow at the outfall varies rapidly. Required stable riprap sizes for such flow fields are different from those for uniform 2-dimensional flow. Models used for the 288 tests performed ranged in size from a 6- by 12-in. rectangular culvert with 1/4-in. riprap to a 36-in.-dia pipe with 7-in.-dia rock. (USBR)
W72-13751

STUDY OF ENVIRONMENTAL IMPACTS OF ALTERNATIVE LONG ISLAND SOUND BRIDGE SITES,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 06G.
W72-13907

WINNEBAGO-BEAN CREEK WATERSHED, RICHARDSON COUNTY, NEBRASKA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 04D.
W72-13951

RED RIVER WATERWAY AND RED RIVER WATERWAY EMERGENCY BANK PROTECTION, MISSISSIPPI RIVER TO VICINITY OF INDEX, ARKANSAS, LOUISIANA, ARKANSAS, OKLAHOMA, AND TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New Orleans, La.

Available from the National Technical Information Service as PB-200 799-D, $3.00 in paper copy. May 1971. 41 p, 1 map.

Descriptors: *Bank protection, *Channel improvement, *Dam construction, *Gulf Coastal Plain, Administrative agencies, Louisiana, Texas, Oklahoma, Bank erosion, Multiple-purpose projects, Irrigation practices, Recreation, Water quality control, Erosion control, Area redevelopment, Economic feasibility, Land management, Arkansas, Mississippi River, Navigable waters.
Identifiers: *Environmental impact statement, *Red River.

The plan of improvement consists of a 9 by 200 foot navigation channel with related bank stabilization and nine locks and dams from the Mississippi River via the Old and Red Rivers to Shreveport, Louisiana, and through Twelve Mile and Cypress Bayous to the vicinity of Daingerfield, Texas. The project will provide a transportation system which at present is not available to the area. Environmental impacts include: flood control benefits, irrigation benefits, improved water quality and availability, additional recreational opportunity, enhanced land utilization, and reduced losses from erosion. Adverse impacts include: moderate losses of wildlife along the entire river reach and the adjacent environs, adverse effects to fishery resources, loss of 65,654 acres of land, loss of forestry resources, and loss of some natural scenic values. Alternatives considered include various navigation routes, alternate channel depths, alternate types of protective works, alternate methods of construction, and variations in the degree of channel alignment. (Waldron-Florida)
W72-13952

LANEPORT, NORTH FORK AND SOUTH FORK LAKES, SAN GABRIEL RIVER, TEXAS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Fort Worth, Tex.

Available from the National Technical Information Service as PB-202 321-D, $3.00 in paper copy. October 2, 1970. 9 p.

Descriptors: *Texas, *Dam construction, *Flood control, *Environmental effects, Project benefits, Floods, Dams, Wildlife habitats, Water supply, Water supply development, Hunting, Fishing, Recreation, Economic impact, Streams, Agriculture, Archaeology, Flood protection, Flood damage, Floodwater, Public health, Social aspects, Water quality, Project purposes, Wildlife.
Identifiers: *Environmental impact statement, *Laneport, North Fork, and South Fork Lakes, San Gabriel River (Tex).

The project involves construction of three dams and lakes to meet the needs of flood control, water conservation, fish and wildlife, and recreation. The area is characterized by rugged topography and contains steeply eroded hills, rocky bluffs, spurs, knobs and escarpments. The lakes will inundate about 8,700 acres of land. The projects will provide opportunities for fishing, hunting and other recreation. There will be increased water supply and decreased destruction of crops, loss of livestock, and unpleasant odors and health problems associated with floods. Adversely, the projects will inundate attractive natural streams and wildlife habitat as well as rich agricultural land presently used for field crops. Approximately 100 archaeological sites will be obliterated. However, provisions for salvage will be made for these sites. The only alternative discussed, that of no action,

would result in constraints on economic development as well as loss of project benefits. The region will receive long-term benefits from dependable water supplies and long-term enhancement of the social and physical environment. A list of agencies consulted is included. (Ilkson-Florida)
W72-13956

AUTHORIZATION OF FEDERAL WATER PROJECTS (FINAL REPORT, DRAFT REVIEW),
National Water Commission, Arlington, Va.
For primary bibliographic entry see Field 06B.
W72-13957

KINGSTREE BRANCH FLOOD CONTROL PROJECT, SOUTH CAROLINA (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.
For primary bibliographic entry see Field 04A.
W72-13960

8B. Hydraulics

AN ANALYSIS AND THE CONTROL OF LOST CIRCULATION,
Stanolind Oil and Gas Co., Tulsa, Okla.
G. C. Howard, and P. P. Scott, Jr.
Transactions, Society of Petroleum Engineers of AIME, Vol 192, p 171-182, 1951. 18 fig, 2 tab, 41 ref.

Descriptors: *Drilling fluids, Fracture permeability, Rotary drilling, Permeability, Sealants.
Identifiers: *Lost circulation, Formation damage, Mud losses.

During the drilling of wells, fractures which are created or widened by drilling fluid pressure are suspected of being a frequent cause of lost circulation. A study of the variables related to fracturing led to the premise that the presence of an effective lost circulation material in a drilling mud stream would serve to plug small fractures at the moment they are encountered or created and, thereby, eliminate a possible cause of lost circulation by preventing fluid pressure from widening and extending the fractures. A large number of lost circulation materials were classified and tested in simulated fractures. Granular type materials with a gradation of particle sizes were found to be the most effective for plugging. Within the limits of pumpability, the concentration in mud of each lost circulation material tested was found to be a controlling factor in determining the maximum size fracture which could be sealed. A new type centrifugal sorter was given preliminary tests and found to be capable of concentrating cuttings for rejection and reclaiming lost circulation materials. (Campbell-NWWA)
W72-13627

ABILITY OF DRILLING MUD TO LIFT BIT CUTTINGS,
Standard Oil and Gas Co., Tulsa, Okla.
H. N. Hall, H. Thompson, and F. Nuss.
Transactions, Society of Petroleum Engineers of AIME, Vol 189, p 35-46, 1950. 10 ref.

Descriptors: *Drilling fluids, *Rotary drilling, Laminar flow, Viscosity, Mud.
Identifiers: *Bit scavenging, Slip velocity.

Removal of bit cuttings is an important function of drilling muds. In an effort to obtain better understanding of the factors influencing the removal of cuttings, an extensive series of laboratory tests were made in which slip velocities of various sizes and shapes of particles were measured in muds of different physical properties. Empirical equations were then derived from these experimental data. These equations show that slip velocity is dependent on cutting size and shape, mud flow constants, and flow state of the mud. Applicability of these equations for field use is demonstrated by comparing computed slip velocities with slip velocities obtained from field tests. (Campbell-NWWA)
W72-13629

PREHISTORIC NEAR-SURFACE SUBSIDENCE CRACKS IN WESTERN FRESHNO COUNTY, CALIFORNIA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W72-13717

AN EXPERIMENTAL STUDY OF THE GROWTH OF MECHANICALLY GENERATED SURFACE WATER WAVES WHEN SUBJECTED TO A FULLY DEVELOPED TURBULENT CHANNEL AIRFLOW,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 02E.
W72-13734

SELECTED STREAMFLOW CHARACTERISTICS AS RELATED TO CHANNEL GEOMETRY OF PERENNIAL STREAMS IN COLORADO,
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 02E.
W72-13736

ROUGHNESS ELEMENTS AS ENERGY DISSIPATORS OF FREE-SURFACE FLOW IN CIRCULAR PIPES,
Virginia Polytechnic Inst. and State Univ., Blacksburg.; and Christian Heritage Coll., San Diego, Calif.
J. M. Wiggert, P. D. Erfle, and H. M. Morris.
Highway Research Record, No 373, p 64-73, 1971. 8 fig, 1 tab, 3 ref.

Descriptors: *Energy dissipation, *Prototype tests, *Model studies, Supercritical flow, Hydraulic jump, Open channel flow, Pipe flow, Pipe design, Velocity, Erosion control, Reynolds number, Froude number, Turbulent flow, Slopes, Hydraulic design, Equations, Scour.
Identifiers: Empirical methods, *Energy dissipators, Friction coefficient.

In laboratory and prototype tests, peripheral rings were used in smooth circular pipes to reduce flow velocities as a means of reducing scour at the outlets. The model was a 6-in.-dia pipe, 28 ft long, in which 3 sizes of rings (roughness elements) were tested in different numbers, spacing, and location, and at several discharges and pipe slopes. An 18-in. concrete pipe, 32 ft long, was also tested to verify model-prototype scaling ratios and compare effects of pipe materials. Empirical relationships were developed for element height, spacing, and pipe diameter. An equation developed enables designers to select the pipe diameter for a given discharge when roughness elements are used. Tests and related computations failed to relate a friction factor to either the Reynolds or Froude numbers. Use of 15 roughness elements improved velocity reduction by only 5% over use of 4 elements. Properly designed roughness elements can reduce the exit Froude number to nearly unity. (USBR)
W72-13747

A SURVEY OF INDEXING AND ABSTRACTING SERVICES FOR WATER RESOURCES ENGINEERING,
Maryland Univ., College Park. Water Research Center.
For primary bibliographic entry see Field 10B.
W72-13820

CHANNEL NETWORK OF A BASIN AND FORMATION OF RUNOFF (RUSLOVAYA SET' BASSEYNA I PROTSESS FORMIROVANIYA STOKA VODY),
Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02E.
W72-13853

TECHNIQUES AND HYDRULIC VERIFICATION OF HYDROMETRIC STUDIES (METODIKA I GIDRAVLICHESKOYE OBOSNOVANIYE GIDROMETRICHESKIKH RABOT).

Descriptors: *Hydraulics, *Hydrometry, *Analytical techniques, *Streamflow, Channel flow, Runoff, Discharge (Water), Water level fluctuations, Stage-discharge relations, Hydrographs, Water balance, Hydraulic structures, Irrigation canals, Irrigation systems, Reservoirs, Hydroelectric plants, Turbines, Routing, Measurement Calibrations.
Identifiers: *USSR, Ukraine, Karelia, Amu-Dar-'ya River, Hydrometric stations.

This collection contains 7 papers devoted to an analysis of the accuracy of hydrometric data for improving the efficiency of streamflow computations under effects of a changing channel. Specific topics discussed include: (1) accuracy of hydrometric data and improved methods of streamflow measurement in unstable channels of the Amu-Dar'ya River; (2) accuracy of measurement of principal water-balance components at the Kiev and Kremenchug Reservoirs in the Ukraine; (3) improved methods of streamflow measurement on mountain streams with erodible and meandering channels; (4) evaluation of water-balance components in middle reaches of the Amu-Dar'ya River; (5) effects of irrigation diversions in middle reaches of the Amu-Dar'ya River; (6) calibration of turbines at the Segozerskiy hydroelectric station in Karelia; and (7) calibration of turbines at large hydroelectric stations during periods of peak power demand. Designed primarily for hydrologists will also prove valuable to scientific workers at research institutes and establishments of the USSR Hydrometeorological Service. (Josefson-USGS)
W72-13861

ALLUVIAL CUTOFF DATING FROM SUBSEQUENT GROWTH OF A MEANDER,
Iowa State Univ., Ames. Engineering Research Inst.
For primary bibliographic entry see Field 02J.
W72-14025

HYDRODYNAMICS OF FREE-BOUNDARY FLOWS,
G. V. Logvinovich.
Available from the National Technical Information Service as TT-70-50187, $3.00 in paper copy, $0.95 in microfiche. National Aeronautics and Space Admin, by Israel Program for Scientific Translations, Jerusalem, 1972. 194 p. (NASA TT F-658. *Translation of Gidrodinamika technii so svobodnymi granitsami, Izdatel'stvo 'Naukova Dumka', Kiev, 1969.).

Descriptors: *Fluid mechanics, *Hydrodynamics, *Boundaries (Surfaces), *Boundary processes, *Flow, Flow characteristics, Properties, Physical properties, Hydrologic aspects, Hydraulics, Drag, Cavitation, Hydrofoils, Profiles, Jets, Gases, Velocity, Submergence, Methodology, Equations.
Identifiers: *USSR.

This monograph on fluid mechanics examines the physical properties of fluids, fluid statics, and problems encountered in fluid motion. The subject matter includes equations and methods for solution of fluid-flow problems by application of the

principles of momentum and energy. Individual topics include: (1) elementary cases of free-boundary flows; (2) symmetric immersion of a body in a fluid; (3) investigations of fundamentals involved in the phenomena of cavitation; (4) application of plane sections to calculation of hydrodynamic forces; and (5) hydrodynamic features of hydrofoils. (Josefson-USGS)
W72-14040

8C. Hydraulic Machinery

TECHNIQUES FOR PREVENTING DIFFERENTIAL-PRESSURE STICKING OF DRILL PIPE,
Continental Oil Co., Ponca City, Okla.
E. L. Haden, and G. R. Welch.
American Petroleum Institute Drilling and Production Practice, March 1961, p 36-41. 3 ref.

Descriptors: *Rotary drilling, *Drilling fluids, Drilling equipment, Pipes, Drilling, Mud.
Identifiers: *Differential pressure sticking, Stuck pipe.

Differential-pressure sticking is a very common occurrence in drilling oil or water wells. Failure to recognize the problem and lack of a preventive technique have made this type sticking costly. A laboratory investigation revealed that in addition to the factors suggested by earlier investigators, mud type and composition influenced the severity of sticking. Tests with surface-active agents and modified collar designs demonstrate these methods to be useful in reducing sticking, but a combination of techniques is necessary for maximum protection. (Campbell-NWWA)
W72-13618

ANALYTICAL DETERMINATION OF OPTIMUM BIT WEIGHT AND ROTARY SPEED COMBINATIONS,
Humble Oil and Refining Co., Houston, Tex.
J. W. Graham, and N. L. Muench.
Preprint 1349-G, October 1959. Society of Petroleum Engineers of AIME. 13 p, 7 fig.

Descriptors: *Rotary drilling, Mathematical studies, Costs, *Drilling.
Identifiers: *Rig cost, Bit weight, Rotary speed.

An analytical method is presented for the selection of optimum combinations of rotary speed and bit weight to minimize total drilling cost. A mathematical analysis of the cost to drill any depth interval is the basis of the method. The results of field experience are used to derive empirical expressions for bit life expectancy and for drilling rate as a function of depth, rotary speed, and bit weight. After the mathematical expressions are adapted to a particular area, the optimum combinations of bit weight and rotary speed can be established. Calculation of combinations of bit weight and rotary speed which are optimum for the conditons of the illustrative field example shows that at depth intervals from 1,000 to 6,000 ft. high bit weights, i.e., in excess of 50,000 lb. at 75 rpm, are necessary to approach minimum total drilling cost. (Campbell-NWWA)
W72-13619

TWO-DIMENSIONAL STUDY OF ROCK BREAKAGE IN DRAG-BIT DRILLING AT ATMOSPHERIC PRESSURE,
Texas Univ., Austin.
K. E. Gray, F. Armstrong, and C. Galtin.
Journal of Petroleum Technology, Vol 225, p 93-98, 1962. 10 fig, 22 ref.

Descriptors: *Drilling, Drilling equipment, *Photography, Films, Failure (Mechanics), Tensile strength, Rock mechanics.
Identifiers: *Tool forces, Rake angles, Photographic studies.

Some preliminary results are presented of two-dimensional cutting tests of dry limestone samples at atmospheric pressure. Cutting tips having rake angles of +30, +15, 0, -15, and -30 deg were used to make cuts on Leuders limestone samples at six depths of cut ranging from .005 to .060 in. at cutting speeds of 15, 109, and 150 ft./min. Motion pictures of the cutting process at camera speeds of 5,000 to 8,000 frames/sec. were taken at strategic points. The movies provide considerable insight into the brittle failure mechanism in rocks. It appears that chip-generating cracks usually have an initial orientation which is related to the resultant of the externally applied forces. Analyses of the forces on the cutting tips indicate that: (1) relatively small increases in vertical loading result in large cut-depth increases for sharp tips (rake angles > 0 deg); (2) tool forces increase at an increasing rate as the rake angle decreases, particularly for rake angles < 0 deg; and (3) for the range of this study, rate of loading had little effect on the maximum forces. Cutting size increases with increased cut depth and rake angles, and decreases slightly at high cutting speeds, the depth of cut having by far the most influence. The amount of contact between the rock and the cutting tip was always less than the depth of cut and rarely exceeded 0.010 in. even for cuts of 0.060 in. (Campbell-NWWA)
W72-13625

DESIGN AND OPERATION OF JET-BIT PROGRAMS FOR MAXIMUM HYDRAULIC HORSEPOWER, IMPACT FORCE OR JET VELOCITY,
Gulf Research and Development Co., Pittsburgh, Pa.
H. A. Kendall, and W. C. Goins, Jr.
Transactions, Society of Petroleum Engineers of AIME, Vol 219, p 238-250, 1960. 9 fig, 17 ref.

Descriptors: *Rotary drilling, Drilling equipment, Hydraulic equipment, Nozzles.
Identifiers: *Jet-bits, Hydraulic horsepower, Compounding pumps.

Several investigations in recent years have shown that drilling rates are increased significantly with increased hydraulic horsepower. But, there has been no over-all method of designing jet-bit programs that efficiently use the surface power. The maximum obtainable bit horsepower, impact force and jet velocity at all depths are described, taking into account the limitations of the pump, piping, hole and minimum circulating rate for adequate cuttings removal. Ranges of operation are developed; and flow rates, surface pressure and bit pressures are specified for each range to provide a maximum of any one of the desired effects. It also is shown that, by proper selection of nozzle sizes and by following the rules presented, the maximum obtainable quantities can be effectively utilized from surface to total depth. Finally, a simple graphical method of selecting nozzle sizes and flow rates is presented which can be used with familiar bit-company hydraulic tables and calculators to design jet-bit programs for maximum bit hydraulic horsepower, impact or jet velocity, as desired. (Campbell-NWWA)
W72-13626

AN ANALYSIS AND THE CONTROL OF LOST CIRCULATION,
Stanolind Oil and Gas Co., Tulsa, Okla.
For primary bibliographic entry see Field 08B.
W72-13627

USE OF CHEMICALS TO MAINTAIN CLEAR WATER FOR DRILLING,
Pan American Petroleum Corp., Tulsa, Okla.
J. P. Gallus, J. L. Lummus, and J. E. Fox, Jr.
Transactions, Society of Petroleum Engineers of AIME, Vol 218, p 70-75, 1958. 5 ref.

Descriptors: *Drilling fluids, Rotary drilling, Flocculation, Polymers, Muds.
Identifiers: Polymer solution, Low-solids muds, *Flocculating agents, Formation permeability.

Fresh water or brine drilling fluids may be kept free of suspended drilled solids by the addition of a water soluble acrylamide-carboxylic aci copolymer at the flowline. Addition of from .01 t 0.2 lb/bbl of the polymer solution to drilling fluids containing less than 5 per cent clay solids by weight causes the solids to flocculate and settle rapidly to the bottom of the pits. Solutions of the polymer injected at the pump suction reduce the loss of water to permeable formations without impairing the permeability to oil. The use of drilling fluids clarified with the polymer has resulted in increased drilling rates, extended bit life, and lower drilling fluid costs. (Campbell-NWWA)
W72-13628

ABILITY OF DRILLING MUD TO LIFT BIT CUTTINGS,
Standard Oil and Gas Co., Tulsa, Okla.
For primary bibliographic entry see Field 08B.
W72-13629

PRESSURE-DIFFERENTIAL STICKING OF DRILL PIPE AND HOW IT CAN BE AVOIDED OR RELIEVED,
Shell Oil Co., Houston Tex. Technical Services Div.
W. E. Helmick, and A. J. Longley.
American Petroleum Institute Drilling and Production Practice, p 55-60, 1957. 2 ref.

Descriptors: *Rotary drilling, *Drilling fluids, Drilling equipment, Pipes, Drilling.
Identifiers: Key-seating, *Pressure-differential sticking.

Investigation of the sticking of drill collars, now called pressure-differential sticking, was initiated after the observation was made that spotting oil would only free pipe that had stuck while remaining motionless opposite a permeable bed. Laboratory investigations established that the force acting to hold the pipe against the side of the hole was proportional to the differential pressure acting across the drill pipe and the area of the pipe isolated from the hydraulic pressure by a thickening mud cake, and that the primary mechanism of release by oil is a wetting action. (Campbell-NWWA)
W72-13630

HOW ROTARY SPEED AND BIT WEIGHT AFFECT ROTARY DRILLING RATE,
Tulsa Univ., Okla.
C. Gatlin.
Oil and Gas Journal, Vol 55, No 20, p 193-198, May 1957. 12 ref.

Descriptors: *Rotary drilling, *Penetration, *Rates, Drilling fluids, Hydrostatic pressure, Drilling.
Identifiers: *Rotary speed, *Bit weight, Drill string failure.

Variables affecting rotary-drilling penetration rate are numerous. Some of the more recognizable are the effects of drilling-fluid properties, hydrostatic pressure, hydraulic factors, rotary speed, and weight on bit. In hard rock areas, penetration rate is limited by the weight on bit or rotary speed which may be applied or both. Normally these limits are imposed by either crooked-hole or equipment considerations. (Campbell-NWWA)
W72-13631

NEW PIPE CONFIGURATION REDUCES WALL STICKING,
Engineering Enterprises, Inc., Houston, Tex.
For primary bibliographic entry see Field 08A.
W72-13633

A STUDY OF ANCHORAGES FOR TRANSMISSION TOWER FOUNDATIONS,
J. I. Adams, and T. W. Klym.
Canadian Geotechniques Journal, Vol 9, No 1, p 89-104, Feb 1972. 12 fig, 3 tab, 8 ref.

Descriptors: *Transmission towers, *Foundations, On-site tests, Glacial soils, Clays, Sands, Gravels, Anchors, Helixes, Grouting, Analysis, Soil mechanics, Loading, Tests, Construction practices, Cyclic loads, Adhesion.
Identifiers: *Uplift footings, *Anchored towers, Guyed towers, Test results, Bonding strength, Pull-out tests, Uplift resistance, Anchored footings, Canada.

Uplift tests were performed at 7 sites on anchors for 4-legged and guyed transmission tower structures. Power installed multihelix anchors and grouted anchors were the main types tested. The multihelix anchors were comprised of 8- to 15-in.-dia helix plates spaced 29 in. apart, drilled to a depth of from 10 to 22 ft. For the grouted anchors, a cased 4- to 8-in.-dia hole from 7 to 75 ft deep was filled with a high-strength grout. A high-strength reinforcing rod was then inserted and the casing withdrawn. To investigate the load distribution, one of the grouted anchors was instrumented with bonded strain gages. Soil conditions included dense glacial till, soft clay, dense sand and gravel, and loose-to-compact silty sand. Uplift loads, consisting of 2 or more load-unload cycles, were applied at a rate of 5,000 to 10,000 lbs/min. The grouted anchor appears best suited for dense glacial tills, dense sand and gravel, and stiff-to-hard clays. The multihelix anchor is suitable for many soils, but may encounter problems in dense till or gravel. In many instances, the choice of anchor would be determined by the cost. (USBR)
W72-13750

SALT RIVER PROJECT 1971 ANNUAL REPORT.
Salt River Project, Phoenix, Ariz. Agricultural Improvement and Power District.
For primary bibliographic entry see Field 04A.
W72-13913

8D. Soil Mechanics

ANALYSIS OF UNCERTAINTY IN SETTLEMENT PREDICTION,
San Diego State Coll., Calif.; and Northwestern Univ., Evanston, Ill.
J. N. Kay, and R. J. Krizek.
Geotechnique, Vol 2, No 2, p 119-129, Dec 1971. 6 fig, 1 tab, 5 ref.

Descriptors: *Settlement (Structural), *Foundations, *Consolidation, Forecasting, Risks, Soil mechanics, Probability, Statistical analysis, Regression analysis, Nomographs, Soil properties, Soil analysis, Void ratio, Stress, Monte Carlo Method, Deformation, Soil consolidation tests.
Identifiers: Empirical equations, Confidence coefficient, Compression index, Deformable soils.

A method is presented for analyzing the uncertainty of predicting settlement by the conventional single answer approach. Instead of individual values, probability distribution functions are used for the compression index, void ratio, and soil stresses found in the formula for computing settlement caused by primary consolidation. The distributions for soil properties are established from a statistical treatment of test results; those for the stress parameters are deduced on a more subjective basis. The study is generalized by repeating the process for a large number of cases. Calculated values are then used in regression analyses to develop empirical equations which provide a measure of the uncertainty associated with a wide range of input parameters. Finally, these equations are represented in the form of nomographs. The solution of an example given indicates a 90% probability that the settlement will lie within the range from 4.2 to 8.4 in. (USBR)
W72-13745

AN EXPERIMENTAL ROCK-SAND DAM,
O. B. Pyshkin.
Hydrotechnical Construction, No 7, p 657-660, July 1971. 4 fig, 8 ref.

Descriptors: *Dam design, *Dam construction, Dams, Rockfill dams, Soil density probes, Construction, Construction methods, Earth dams, Seepage, Rocks, Sands, Slurries, Soil density.
Identifiers: *Rock-sand dams, USSR, Sand fills, Sluicing, Dam facings, Test results, Hydraulic fill dams.

As an alternative to rockfill dams with cutoff walls and central cores, an experimental rock-sand dam constructed shows high imperviousness and seepage stability. The dam dimensions were: height 7.5 m, crest width 2 m, base width 23.6 m, length 4 m, volume 400 cu m, upstream face slope 1:1.25, downstream face slope 1:1.5. In constructing the dam, the first step was to build the dam body, using 8- to 60-cm sorted rocks. As the rockfilling progressed, piezometers were installed. The water level was raised to 2.5 m and 3 conduits were placed at 2.0 m. A sand slurry was sluiced down the 4 conduits and into the body of the dam; slurry was then sluiced into the opposite face of the dam at the same level. The water level was then increased and the procedure repeated at 7 levels until the sand slurry had been sluiced into the entire structure. The sand had an effective diameter of 0.11 mm and an inplace density of 1.65 kg/cc. To stabilize the sand, a layer of crushed rock of 5- to 40-mm grain size was placed on the upstream and downstream slopes. (USBR)
W72-13752

SMALL DIAMETER SAND DRAINS,
Cementation Co. Ltd., Croydon (England).
F. H. Hughes, and A. Chalmers.
Civil Engineering, Vol 67, No 788, p 283-286, Mar 1972. 1 fig, 4 photo, 7 ref.

Descriptors: *Flexibility, *Permeability, Drainage, Groundwater, Pore pressure, Consolidation, Dissipation, Drain spacing, Clogging, Slope stability, Settlement (Structural), Shear strength, Soil mechanics, Piezometers.
Identifiers: *Sand drains, Great Britain, Stress paths, Diameters, Pore water pressure.

A better understanding of the mechanism of soil permeability, drainage, consolidation, and failure has resulted in renewed interest in the use of placed drains to improve the rate of pore pressure dissipation. The aims of using sand drains to permit accelerated dissipation of pore water pressure by lateral drainage in clay soils fall into 3 categories: (1) In embankment or foundation construction on weak clay soils, the sand drain allows a more rapid increase in shear strength. (2) Because maximum settlement during the construction period is desirable to avoid damage to the structure, the time of structural movements can be reduced. (3) Cuttings or natural slopes where high water pressures exist can be stabilized by bored underdrainage. Ideally, a drain should have the following qualities: (1) high permeability to enable rapid dissipation; (2) good flexibility to permit large ground movement and not act as a pile, preventing consolidation; (3) continuous flexibility to maintain a good hydraulic connection over its entire length; (4) ease of placement in the soil; (5) remain useful over the required period; (6) retain all these properties during increased stress; and (7) avoid clogging by the surrounding fine soils. (USBR)
W72-13756

EQUIPPING STRUCTURES OF HYDROELECTRIC POWER STATIONS WITH MEASURING DEVICES FOR MONITORING PERCOLATION,
M. M. Dorokhov.
Hydrotechnical Construction, No 7, p 661-664, July 1971. 2 fig.

Descriptors: *Percolation, *Water measurement, *Electronic equipment, Piezometers, Water levels, Automation, Dam foundations, Remote control, Hydraulic structures, Indicators, Manometers, Transducers, Percolating water, Seepage, Instrumentation, Piezometry, Measuring instruments, Pressure measuring instruments, Monitoring.
Identifiers: *Water-level recorders, USSR, Piezometric head, Piezometric surface.

The use of remote-controlled indicating and recording instruments for monitoring percolation in hydraulic structure foundations is examined. The 2 electrical instruments used for measuring piezometer tube water levels are an electric manometer and an automatic indicator and recorder. The electric manometer acts as a transducer to convert head changes into electric signals, which activate the automatic indicating and recording instrument. Similar equipment could be used to monitor free seepage over the entire area of a hydrodevelopment, the levels of the pools and heads of a hydroelectric powerplant, and discharges of the powerplant units, and allow complete or partial centralization of all the powerplant measurements. Diagrams are given of the systems used at several Soviet hydroelectric powerplants. (USBR)
W72-13758

DIVELY DRAINAGE AND LEVEE DISTRICT (DISTRICT 23), ILLINOIS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, St. Louis, Mo.

Available from the National Technical Information Service as PB-205 236-D, $3.00 in paper copy. November 4, 1971. 42 p, 1 map, 7 tab.

Descriptors: *Illinois, *Flood protection, *Levees, *Environmental effects, Wildlife habitats, Aesthetics, Borrow pits, Riprap, Flood control, Flood frequency, Impoundments, Rivers, Flood damage.
Identifiers: *Environmental impact statement, *Fayette County (Ill).

The project is designed to improve flood protection and interior drainage in the Dively Drainage and Levee District, Fayette County, Illinois on the Kaskaskia River. The plan of improvement involves construction of approximately 3.53 linear miles of earth levee thereby providing protection against a flood frequency of one every 30 years. Additionally three gravity drains and three collector ditches will be installed. The left bank of the river will be riprapped in selective reaches. Environmental impacts of the project include: reduced annual flooding, conversion of 170 acres of woodland to cropland, loss of wildlife habitats in the converted area, loss of 102 acres for borrow pits, and aesthetic impairment of the river bank from riprapping. Adverse impacts include: loss of 130 acres of wildlife habitat; aesthetic loss from bank riprapping for 3,800 feet; and borrowing from 102 acres, however, natural vegetation will return to the area. Alternative structural plans such as different levee alignments, impoundments, river cutoffs, pumping stations, and various combinations were considered. (Grant-Florida)
W72-13955

AUTHORIZED CHINA MEADOWS DAM AND RESERVOIR LYMAN PROJECT, WYOMING

(DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Salt Lake City, Utah. Region 4.

Available from the National Technical Information Service as PB-205 581-D, $3.00 in paper copy. January 6, 1972. 76 p, 2 map, 1 photo, 6 tab, 7 append.

Descriptors: *Utah, *Flood control, *Environmental effects, *Dam construction, Irrigation water, *Wyoming, Soil mechanics, Dikes, Earthworks, Land use, Fish conservation, Wildlife conservation, Water management (Applied), Recreation, Storage reservoirs, Reservoir sites, Wildlife habitats, Fisheries, Forages.
Identifiers: *Environmental impact statement, *China Meadows Dam and Reservoir (Wyo).

The proposed project calls for construction of a 2,350 foot long, 109 foot high earthfill dam and dike. The damsite is located in Utah about 25 miles south of Mountain View, Wyoming. The completed project will reduce floods from high spring runoff, provide higher summer flows for an extended irrigation season and minimum flows to preserve stream fishery during nonirrigation season. Inundation of 372 acres of meadow and forest will result in the loss of: 2 miles of quality trout stream; 205 acres of timber; grazing lands; spring and fall forage for an undetermined number of elk, moose, and deer; and 13 family campground units. The major impacts of the project are of a long-term nature. The most significant will be the influx of people and increase in recreational activity. Construction of the project will permanently alter the esthetic value of the site as the recreational attraction offered by the reservoir would encourage further use of the present wilderness area. Alternatives to the proposed project are the inclusion of China Lake in the reservoir, the enlargement of Marsh Lake, the use of other storage sites, and no development. (Waldron-Florida)
W72-13963

LITTLE RIVER INLET, NORTH CAROLINA AND SOUTH CAROLINA, NAVIGATION IMPROVEMENTS (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Charleston, S.C.
For primary bibliographic entry see Field 04A.
W72-13964

LOST CREEK LAKE PROJECT, ROGUE RIVER, OREGON (DRAFT ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.

Available from the National Technical Information Service as PB-206 619-D, $3.00 in paper copy. January 1972. 40 p, 2 map, 5 photo, 4 tab.

Descriptors: *Multiple-purpose projects, *Dam construction, *Oregon, *Environmental effects, Dams, Flood control, Project planning, Water management (Applied), Levees, Water quality control, Damsites, Embankments, Wildlife habitats, Industrial water, Municipal water, Fisheries, Electric powerplants, Hydroelectric plants, Recreation, Irrigation, Adoption of practices, Non-structural alternatives, Highway relocation, Water conservation.
Identifiers: *Environmental impact statement, *Rogue River, *Lost Creek Dam Project (Ore), *Embankment dams.

The project involves construction of an embankment dam and related structures on the Rogue River, Jackson County, Oregon, to provide 315,000 acre feet of usable water storage for flood control, water conservation, water supply, water quality control, recreation, and 49,000 kw of electric power generation. The environmental impact will include: flooding of the river valley behind the dam now used for timber production, farming, pasture, and wildlife habitat; loss of an 11-mile stretch of natural stream to be covered by the lake; reduction of flood damage downstream along the Rogue River; provision of water for irrigation, municipal and industrial water supply, recreation, fish and wildlife, power, and water quality improvement; and hatchery production to mitigate fisheries losses. Adverse environmental effects include: the loss of wildlife habitat and timber production on land needed for the lake, road relocation, and project construction; loss of natural stream with anadromous fish spawning; loss of rearing areas within the proposed lake area; and adverse aesthetic conditions during periods of pool drawdown. Alternatives include: levee protection, flood plain zoning, and/or flood plain evacuation; a similar dam at another site; a dry reservoir alternative; and a concrete dam. (Widman-Florida)
W72-13965

STUART GULCH DAM, IDAHO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Walla Walla, Wash.

Available from the National Technical Information Service as PB-198 722-F, $3.00 in paper copy. August 6, 1971. 30 p, 1 map, 4 tab.

Descriptors: *Dam construction, *Idaho, *Flood protection, *Stream stabilization, Area redevelopment, Tributaries, Intermittent streams, Earth dams, Dam design, Silting, Channel improvement, Land use, Non-structural alternatives, Water resources development, Flood control, Vegetation effects, Wildlife habitats, Air pollution, Storm runoff.
Identifiers: *Environmental impact statement, *Stuart Gulch Dam (Idaho).

The project involves construction of a local flood detention dam on the intermittent stream in Stuart Gulch, a minor tributary of the Boise River. The dam will be an earthfill structure with an ungated spillway and a concrete conduit outlet and will be 54 feet high and 1054 feet long. Stuart Gulch is a small intermittent flowing stream located in a canyon. The major environmental impact of the project will be to prevent flooding of the northwestern section of Boise, and would encourage redevelopment of the area. Adverse impacts include: periodic short-term flooding, silt deposition on the canyon floor, and loss of some nesting habitat. Alternatives to the project include: (1) no action, (2) enlarge the channel, (3) utilize watershed treatment and positive land management to attempt to reduce runoff, and (4) flood plain zoning and floodproofing. With the advent of the proposed project, flood protection would be provided for the existing development and lands of the flood plain, but the potential for future high density development in the project area will be eliminated. (Waldron-Florida)
W72-13968

8E. Rock Mechanics and Geology

TWO-DIMENSIONAL STUDY OF ROCK BREAKAGE IN DRAG-BIT DRILLING AT ATMOSPHERIC PRESSURE,
Texas Univ., Austin.
For primary bibliographic entry see Field 08C.
W72-13625

8F. Concrete

MICROCRACKING EFFECT ON FLEXURAL STRENGTH OF CONCRETE AFTER REPEATED LOADING,
Ritsumeikan Univ., Kyoto (Japan); and Osaka City Univ. (Japan).
A. Yoshimoto, S. Ogino, and M. Kawakami.
Journal of the American Concrete Institute, Proceedings, Vol 69, No 4, p 233-240, Apr 1972. 8 fig, 8 ref.

Descriptors: *Concrete technology, *Fatigue (Materials), Beams (Structural), Concretes, Strain measurement, Test procedures, Tensile stress, Microscopy.
Identifiers: *Flexural strength, *Cyclic loads, Bonding strength, Microstructure, Test results, Stress concentration, Bond, Crack propagation, *Microcracks, Japan, Cement, Paste.

Because little is known of the strength of concrete beams after repeated loading, a study was made of the flexural strength of beams under these conditions. Data are presented on the flexural strength of concrete beam specimens after repeated loading at low cycles and on the effects of microcracking on beam strength. Conclusions are: (1) Repeated loading had little effect on the flexural strength of most specimens, but strength increased in some specimens. (2) Microcracks, which develop in the cement paste, relieved the stress concentrations at the tip of the bond cracks, resulting in increased flexural strength of the concrete. (3) Presence of microcracks does not necessarily lead to fracture of the concrete. (USBR)
W72-13744

COLUMN LOAD INFLUENCE ON REINFORCED CONCRETE-BEAM COLUMN CONNECTION,
Waterloo Univ. (Ontario); and Construction for the Government of the Northwest Territories, Yellowknife.
E. F. P. Burnett, and R. J. Trenberth.
Journal of the American Concrete Institute, Proceedings, Vol 69, No 2, p 101-109, Feb 1972. 8 fig, 3 tab, 7 ref, append.

Descriptors: *Reinforced concrete, *Columns, *Beams (Structural), Reinforcing steel, Structural behavior, Structural design, Structural concrete, Loads (Forces), Structural models, Model tests, Spans, Movement, Moments, Ductility, Failure.
Identifiers: *Continuous beams, *Stirrups, Strain hardening, Inelastic action, Flexural strength, Yield strength, Canada, Beam columns, Yielding.

Nine reinforced concrete systems having 2-span continuous beams and a centrally located stub column were tested. The stub column stress remained constant during the test, but varied from 0 to 2,000 psi during the test series. The 6- by 10-in. cross-section beams were approximately 10 ft long and were point-loaded about 4 ft from the stub column. Apart from the preyield cyclic loads applied in some tests, all beam loading used deflection controlled methods. Test results indicate: (1) Increased column loads significantly decrease the inelastic ductility of yielded beams; (2) equivalent simply supported models indicate overly optimistic estimates of the inelastic ductility of yielded beams; and (3) to obtain valid information from beam-column models, both the column and its load must be simulated. (USBR)
W72-13748

SHORT-TIME DEFLECTIONS OF BEAMS UNDER SINGLE AND REPEATED LOAD CYCLES,
Portland Cement Association, Skokie, Ill.; and Iowa Univ., Iowa City.
K. M. Kripanarayanan, and D. E. Branson.

Journal of the American Concrete Institute, Proceedings, Vol 92, No 2, Part I, p 110-117, Feb 1972. Part II Suppl (unpubl), p 1-14. 9 fig, 7 tab, 14 ref, append.

Descriptors: *Beams (Structural), *Cracks, *Cyclic loads, *Deflection, *Prestressed concrete, *Reinforced concrete, Test procedures, Lightweight concretes, Modulus of elasticity, Yield strength, Structural design, Prestressing, Forecasting, Movement.
Identifiers: Deflection measurement, Composite beams, Moments of inertia, Test results.

A simple and efficient design procedure is presented for predicting the entire short-time load-deflection curve of a beam (or a single point, such as at maximum load) under repeated load cycles into the cracking range. The study includes loading, recovery, and reloading parts of the load-deflection curve. The effective moment of inertia concept adopted by ACI 318-71 for predicting deflections of reinforced beams is extended to both prestressed and reinforced beams under repeated load cycles, including varying load levels, into the cracking range. The reliability of the procedure is indicated by comparisons between computed results and experimental data for 15 prestressed concrete beams, and with data in the literature for reinforced concrete beams. (USBR)
W72-13749

THE INFLUENCE OF REINFORCEMENT DETAILING ON THE STRENGTH OF CONCRETE STRUCTURES,
Cement and Concrete Association, London (England).
G. Somerville, and H. P. J. Taylor.
Structural Engineering, Vol 50, No 1, p 7-19, Jan 1972. 25 fig, 2 tab, 19 ref.

Descriptors: *Reinforcement, *Reinforced concrete, *Joints (Connections), *Structural design, Reinforcing steel, Concrete structures, Test procedures, Structural engineering, Bibliographies.
Identifiers: Great Britain, Beam columns, Test results, Flexural strength.

Experimental data are presented showing the influence of reinforcement detailing on the structural efficiency of half-joints, joggled splices in columns, flexural corners, and in situ concrete beam-column joints. Test data confirmed that the most efficient reinforcement arrangement in design generally can be determined by considering the forces involved. The influence of tolerances and workmanship on strength was particularly important for half-joints. No serious detailing problems arise for joggled splices or for flexural corners being closed. The strength of opening flexural corners greatly depends upon the reinforcement details used, particularly for a high percentage of steel. Design considerations applicable to reinforcement detailing are: (1) a statically determinate set of forces inside an element; (2) capability of the system to carry the collapse load; and (3) controlling cracking under service load, or proportioning members to prevent cracking. (USBR)
W72-13753

FACTORS AFFECTING THE FLEXURAL STRENGTH OF STEEL FIBROUS CONCRETE,
Batelle Memorial Inst., Columbus, Ohio. Columbus Labs.
M. J. Snyder, and D. R. Lankard.
Journal of the American Concrete Institute, Proceedings, Vol 69, No 2, p 96-100, Feb 1972. 3 fig, 1 tab, 9 ref.

Descriptors: *Concrete mixes, *Concrete testing, *Fibers, Aggregates, Coarse aggregates, Beams (Structural), Concretes, Mortar, Steel, Strength, Deflection, Consolidation, Spacing, Volume, Test specimens, Laboratory tests, Reinforced concrete.
Identifiers: *Flexural strength, Steel fibers, Water-cement ratio, Test results, Reinforcing materials.

Investigations were made of the effects of steel fibers on flexural strength of concretes and mortar. Using beam-shaped specimens 2.5 by 3.0 by 16.0 in., high carbon steel fibers in 7 diameters were tested in lengths of 0.25 to 2.5 in. Other variables included aggregate size, water-cement ratio, percentage volume of steel fibers, and amount of water-reducing admixtures. Specimens were cured under low pressure steam at 140 deg F for 7 days. Deflection, first-crack strength, and ultimate flexural strength were measured. Tests showed that first crack and ultimate flexural strengths were influenced by length, diameter, and quantity of steel fibers. Also influencing strength was the degree of consolidation, fiber distribution, and surface condition of the fiber. Significant increases in strengths (up to 4 times) can be achieved through use of short, small diameter steel fibers. Strength increases with decreased fiber spacing, but adding coarse aggregate reduces strength. (USBR)
W72-13754

8G. Materials

WHICH LOST-CIRCULATION MATERIALS TO USE ... AND HOW TO USE THEM,
Magnet Cove Barium Corp., Houston, Tex.
B. Q. Green.
Oil and Gas Journal, Vol 57, No 11, p 110-115, 170-173, March 1959. 9 fig, 5 ref.

Descriptors: *Drilling fluids, Rotary drilling, Cavitation, Sealants, Mud.
Identifiers: *Lost circulation, Formation damage, Mud losses.

Results are described of lab tests made on materials used to prevent and cure loss of circulation of drilling mud. Conclusions are that: (1) size of particles necessary to seal is proportional to the size of the openings to be sealed; (2) the seal must take place inside the opening; (3) fifteen pounds of lost-circulation material per barrel is about optimum; (4) if 15 lb/bbl doesn't seal, use a larger particle size or different distribution of sizes; (5) a waiting period is vital because it permits solids to accumulate in the bridge through filtration. (Campbell-NWWA)
W72-13621

SQUEEZE SLURRIES FOR LOST CIRCULATION CONTROL,
Pan American Petroleum Corp., Tulsa, Okla.
J. L. Lummus.
Petroleum Engineer, p 59-64, September 1968.

Descriptors: *Rotary drilling, *Drilling fluids, Bentonite, *Louisiana, *Sealants, Wells.
Identifiers: *Lost circulation, Induced fractures, *Squeeze slurries, Vugs, Loss zones, Cementing procedures.

Mechanisms are described by which squeeze slurries work to fill cracks and voids where lost circulation occurs. Methods and techniques for emplacement of slurries, and test results from wells drilled in Louisiana are discussed. Different slurry types and techniques of emplacement are described for vugs or caverns and induced fractures, with formulation procedures for both. (Campbell-NWWA)
W72-13622

A NEW LOOK AT LOST CIRCULATION,
Pan American Petroleum Corp., Tulsa, Okla.
J. L. Lummus.
Petroleum Engineer, p 69-73, November 1967. 9 ref.

Descriptors: Rotary drilling, *Drilling fluids, Fracture permeability, *Sealants, Wells.
Identifiers: *Lost circulation, Vugs, *Mud losses, Jet bits.

Lost circulation is one of the greatest expenses faced by the industry in drilling a well. There is a general understanding of the types of lost circulation and the conditions under which these occur, but there is a lack of confidence in materials commercially available for sealing off loss zones. Pertinent points concerning a lost circulation material are: (1) it should contain high strength particles with a definite size distribution; (2) it should form an effective seal under both low and high differential pressure conditions; and (3) it should be equally effective in sealing unconsolidated formations and fractures or vugs in hard formations. (Campbell-NWWA)
W72-13623

CHEMICAL REMOVAL OF DRILLED SOLIDS,
Pan American Petroleum Corp., Tulsa, Okla.
J. L. Lummus.
Drilling Contractor, p 50-67, March-April, 1965. 6 ref.

Descriptors: Rotary drilling, *Drilling fluids, *Flocculation, Flotation, Hydration, Bentonite, Surfactants, Drilling.
Identifiers: Methylene blue, *Scavenging, Selective flocculation.

Chemical methods are required for economical removal of solids smaller than 10 microns. Of the various chemical methods investigated flocculation was found to be the most effective and, as a result, flocculants are now widely used for complete removal of all solids or for maintaining the solids content at a low level. Two new terms are introduced. Complete flocculation is used to describe a flocculation technique which removes all solids. The term selective flocculation describes use of a flocculant which flocculates and removes drilled solids yet at the same time increases the yield of Wyoming bentonite. Examples of how these two flocculation methods are employed in treating field drilling muds to reduce drilling costs are given. A more accurate method of determining the high yield clay content of drilling muds has been developed which has proved useful for treating low solids muds. A graph is included which shows the relationship between density, clay solids, and oil content. The graph is used as a check on mud solids content values obtained using the standard retort method. (Campbell-NWWA)
W72-13624

WHY ROCK-BIT BEARINGS FAIL,
G. R. King.
Oil and Gas Journal, Vol 57, No 47, p 166-182, November, 1959.

Descriptors: *Rotary drilling, Drilling equipment, *Bearings, Wells, Drilling, Abrasion.
Identifiers: *Drill bits, Spalling, Roller bearings, Quebracho, Hydrogen sulfide.

Testing work done on rock-bit bearings is summarized. Many of the most common materials in drilling mud drastically shorten bearing life; and, as a result, increase the cost of wells. These findings led many to believe that sealing bit bearings to keep drilling fluid out is the next important step in making drilling cheaper. Materials and methods tested included water, hydrogen sulfide, mud solids, caustic quebracho, tannins, bit weight, and rotary speed. The wear processes of abrasion, spalling, and scaling are discussed. (Campbell-NWWA)
W72-13632

8H. Rapid Excavation

COMPETITION AND ISOLATION MECHANISMS IN THE GAMBUSIA AFFINIS X G. HETEROCHIR HYBRID SWARM,
Texas Univ., Austin. Dept. of Zoology.
C. Hubbs.
Bull Tex Mem Mus. 19. p 1-46. 1971. Illus.
Identifiers: *Livebearers, *Life history studies, Competition, Gambusia affinis, Gambusia heterochir, Genes, Hybrids, Interactions, Interspecies, Isolation, Mechanisms, Pools.

An analysis of more than 95,323 preserved and 1028 live Gambusia obtained data on several aspects of life history in addition to those on hybridization and interspecies interactions. The tests with living fish were in agreement with the data obtained from preserved samples. The most dense populations of Gambusia were in shallow water with thick aquatic vegetation. These areas also contained the largest fish. Gambusia trap captures were distinctly greater during some clock hours than during others. Traps set during darkness had few fish as did those set during early afternoon hours. Morning and late evening traps contained the most fish. Gambusia females grow rapidly until sexual maturity, after which growth slows. Populations of G. affinis are most abundant in fluctuating temperature environments in summer and in constant temperature environments in winter. All analyses of male morphology produce a trimodal distribution indicating a higher frequency of F1 hybrids than backcrosses, yet putative hybrid females have a fecundity equivalent to the parental types. The low survival of backcross hybrids and of potential introgressive genetic material may result from inability to compete for a niche in the presence of a co-adapted species gene pool.--Copyright 1972, Biological Abstracts, Inc.
W72-13718

EFFICIENT EXCAVATION,
F. Gaye.
Tunnels and Tunnelling, Vol 4, No 1, Part I, p 39-41, 43, 45-48, Jan-Feb 1972; Vol 4, No 2, Part 2, p 135-143, Mar-Apr 1972. 16 fig, 13 plate, 4 tab, 15 ref, 2 append.

Descriptors: *Tunneling machines, *Rock excavation, *Efficiencies, *Rock properties, *Performance, Bibliographies, Tunnels, Energy, Thrust, Hardness, Test procedures, Laboratory tests, Durability, Rotation, Boring machines.
Identifiers: *Cutters, Great Britain, Wear, Rock breakage, Underground openings, Test results.

Cutting head design for hard rock tunneling machines, with particular emphasis on excavation efficiency, is reviewed. Cutting tools may be efficient in producing maximum rock breakage for low energy absorption, but inefficient boring operations may result. Results obtained during laboratory tests of cutting tools may be wholly misleading because the requirements of machines working underground are very different. Some tools found highly efficient in single-tool experiments fail to compete with less efficient tools showing less wear over long periods of underground operation. The basic mechanism of rock-cutting is applied to full-face tunneling machines of circular cross section. The basic fundamentals essential to understanding the boring process, rather than design details, are emphasized. The number and types of cutters, rock hardness and cuttability, and tests on different types of rock are discussed. (USBR)
W72-13746

8I. Fisheries Engineering

LIFE HISTORY AND ECOLOGY OF THE GIZZARD SHAD, DOROSOMA CEPEDIANUM (LE SUEUR) WITH REFERENCE TO ELEPHANT BUTTE LAKE,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 02H.
W72-13927

REPRODUCTION OF TILAPIA NILOTICA L,
Alexandria Inst. of Oceanography and Fisheries (Egypt).
S. El-Zarka, A. H. Shaheen, and A. A. El-Aleem.
Bull Inst Oceanogr Fish. 1: 193-204. Illus. 1970.
Identifiers: Dimorphism, *Reproduction, Sexual, *Spawning, *Tilapia-Nilotica.

T. nilotica is a mouth breeder and both sexes perform the function of carrying the eggs and young in their mouths. The spawning extends from April to Aug. with its maximum activity in May and June. Sexual dimorphism is quite distinct where reddish coloration is shown on the bellies and the ventral sides of both sexes during the spawning season. Breeding takes place at temperature ranging from 19.2 degrees to 26.8 degrees C. This fish begins to spawn at its 2nd yr of life (scale having an annulus). The minimum length recorded for the mature males and females was 8 cm and 10 cm, respectively. Males are represented by a low percentage (38.6%) during the spawning season. From Jan. to March and from Sept. to Dec., the percentage of males in the catches increased to 59.8% and to 44.3%, respectively.--Copyright 1972, Biological Abstracts, Inc.
W72-14042

RESPONSES OF A BROOK TROUT (SALVELINUS FONTINALIS) POPULATION TO HABITAT DEVELOPMENT IN LAWRENCE CREEK,
Wisconsin Dept. of Natural Resources, Madison.
R. L. Hunt.
Tech Bull, 48. 1-35, Illus, 1971.
Identifiers: *Brook trout, Habitat, *Lawrence Creek, Salvelinus-Fontinalis, Trout, *Wisconsin.

Man-made modifications of trout habitat in the upper mile of Lawrence Creek were followed by significant increases in standing crops of wild brook trout, angler use and yield. An obvious stock piling effect was evident, a result primarily of improved overwinter survival after development. Trout production (total growth) also increased after development. Multiple and partial correlation analyses involving 6 environmental variables and 4 trout population variables indicates that trout carrying capacity of an undeveloped section of stream was limited by the physical quality of the habitat, especially the amount of pool area and permanent bank cover. Both of these environmental components were greatly increased by the development and the trout population increased in response.--Copyright 1972, Biological Abstracts, Inc.
W72-14108

PRELIMINARY OBSERVATIONS OF SUPERINTENSIVE FISH CULTURE IN THE BEITH-SHEAN VALLEY IN 1969-1970,
Laboratory for Research Fish. Dis., Nir Dawid (Israel).
M. Marek, and S. Sarig.
Bamidgeh. 23 (3): 93-99. 1971.
Identifiers: *Air compressors, *Beith-Shean Valley (Israel), Fish culture, Israel, Ponds.

Preliminary experiments in ponds are described, using high densities of fish in mixed culture, and using air compressors to aerate the water. The yields were higher than usual for the area.--Copyright 1972, Biological Abstracts, Inc.
W72-14111

INTERACTION BETWEEN THE COMMON CARP (CYPRINUS CARPIO) AND THE SILVER CARP (HYPOTHALAMICHTHYS MOLITRIX) IN FISH PONDS,
Fish Culture Research Station, Dor (Israel).
A. Yashouv.
Bamidgeh. 23 (3): 85-92. 1971.
Identifiers: Biomass, *Silver carp, *Cyprinus-Carpio, Fish, Hypophthalmichthys-Molitrix, *Phytoplankters, Plankton, Ponds.

Carp and silver carp were grown together in fertilized ponds without the provision of additional feed. The carps attained a biomass of 723 kg/ha in contrast to only 391 kg/ha when grown in monoculture. The biomass of the silver carp also was higher in mixed culture. It is believed that this was due to an increase in available food for both species of fish. The silver carp produce feces rich in undigested phytoplankters, which fall to the bottom and are consumed by the carp, while the carp dig around in the bottom mud and stir up organic detritus, which then is consumed by the silver carp as though it were plankton.--Copyright 1972, Biological Abstracts, Inc.
W72-14112

FISHERIES AND FISH CULTURE IN ISRAEL IN 1970,
Laboratory for Research Fish. Dis., Nir Dawid (Israel).
S. Sarig.
Bamidgeh. 23 (3): 63-84. 1971.
Identifiers: Fish cultures, Fisheries, *Israel.

The statistics of the fish catch for Israel are given for 1970. There was a 9% increase of the total catch as compared to 1969. This was primarily due to a great increase in the catch of pond fish (17.3%). The catch of the deep-sea fishery declined by 8.4%. Various other aspects of the fishery are summarized, such as the catch by species, stocking of fry, the canning industry, fish culture and marketing.--Copyright 1972, Biological Abstracts, Inc.
W72-14113

HARVEST AND FEEDING HABITATS OF LARGEMOUTH BASS (MICROPTERUS SALMOIDES) IN MURPHY FLOWAGE, WISCONSIN,
Wisconsin Dept. of Natural Resources, Madison.
H. E. Snow.
Tech Bull. 50. 1-24. Illus. 1971.
Identifiers: *Bass, Bluegills, Bullheads, Crayfish, *Feeding habits, Harvest, *Largemouth bass, Micropterus-Salmoides, Vegetation, Wisconsin.

From 1955 through 1969 the harvest and feeding habitats of largemouth bass were studied under liberalized fishing regulations and a compulsory creel census. The annual harvest of bass by anglers averaged 2.7 fish or 2.9 lb/acre. Bass fishing was most productive during May and June, and about 75% of all bass were taken on artificial lures. Of the total weight of all items consumed by bass, crayfish comprised 54.6%, fish (mainly bluegills and bullheads) 38.3%. As bass increased in size, the size of bluegills and crayfish consumed increased. Prior to an overwinter drawdown, crayfish were the most important item consumed, bullheads were positively selected and bluegills were neither selected or avoided. After the drawdown which was accompanied by a known decline in aquatic vegetation abundance and an apparent decline in crayfish abundance, consumption of bluegills increased.--Copyright 1972, Biological Abstracts, Inc.
W72-14114

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

WATER RESOURCES RESEARCH CATALOG, VOLUME SEVEN.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 09C.
W72-13617

ANNUAL REPORT, FISCAL YEAR 1970-1971.
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 09D.
W72-13821

9C. Research Facilities

WATER RESOURCES RESEARCH CATALOG, VOLUME SEVEN.
Office of Water Resources Research, Washington, D.C.

Available from Supt. of Doc, Washington, DC 20402, for $16.25 a set. Vol 7, Pts. 1 and 2, 1972. 2660 p, 4 index.

Descriptors: *Research and development, *Projects, *Water resources development, *Contracts, Programs, Project planning, Project purposes, Federal government, Federal project policy.
Identifiers: *Water resources research catalog.

The Water Resources Research Catalog, vol 7 is a tabulation of descriptions of 6,371 research projects, most of which are funded by the U. S. Government. Some of the projects are independently funded and voluntarily reported. Each project description includes the name of the investigator, title of the project, object of study, plan of work, and source of support. The catalog lists 7,161 investigators, 1,087 performing organizations, and 548 supporting organizations.
W72-13617

9D. Grants, Contracts, and Research Act Allotments

ANNUAL REPORT, FISCAL YEAR 1970-1971.
Rutgers - The State Univ., New Brunswick, N.J. Water Resources Research Inst.

Available from the National Technical Information Service as PB-211 861, $3.00 in paper copy, $0.95 in microfiche. August, 1971. 90 p, 102 ref. OWRR A-999-N.J. (6).

Descriptors: *New Jersey, *Research and development, *Water Resources Institute, Hydrology, Hydraulics, Water management (Applied), Planning, Aeration, Biochemical oxygen demand, Water pollution.

Research progress and prospects are summarized under the headings: hydrology and hydraulics; water supply management and planning; instream aeration and biochemical oxygen demand; other pollution problems; and institutional and political studies. Details are given in 35 project reports by principal investigators.
W72-13821

10. SCIENTIFIC AND TECHNICAL INFORMATION

10A. Acquisition AND Processing

A LITERATURE SEARCH AND CRITICAL ANALYSIS OF BIOLOGICAL TRICKLING FILTER STUDIES-VOL. I.
Dow Chemical Co., Midland, Mich. Functional Products and Systems.
For primary bibliographic entry see Field 05D.
W72-13638

A LITERATURE SEARCH AND CRITICAL ANALYSIS OF BIOLOGICAL TRICKLING FILTER STUDIES - VOL II.
Dow Chemical Co., Midland, Mich. Functional Products and Systems.
For primary bibliographic entry see Field 05.
W72-13639

10B. Reference and Retrieval

WATER RESOURCES RESEARCH CATALOG, VOLUME SEVEN.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 09C.
W72-13617

A SURVEY OF INDEXING AND ABSTRACTING SERVICES FOR WATER RESOURCES ENGINEERING,
Maryland Univ., College Park. Water Research Center.
H. Wellisch.
Available from the National Technical Information Service as PB-211 913, $4.85 in paper copy, $0.95 in microfiche. Maryland Water Resources Research Center Technical Report No 11, 1972. 95 p, 6 fig, 9 tab, append. OWRR A-999-MD (6).

Descriptors: *Bibliographies, *Abstracts, *Indexing, *Hydraulic engineering, *Information retrieval, Data storage and retrieval, Hydrology, Methodology, Data processing, Data transmission, Computer programs, Documentation, Editing, Libraries, Technical writing, Reviews.
Identifiers: *Abstract services.

This report provides a complete and up-to-date review of the abstracting and indexing services available in water resources engineering. Between 1955 and 1970 the number of services in this field increased from about 20 to 40. This exponential growth or doubling every 15 years suggests that by 1985 there will be 80 abstracting services inexistence. Abstracting and indexing services were evaluated from all over the world to find out whether the existing services are adequate in number, quality and coverage. In view of the increasing tendency to retrieve information from secondary literature tools with the help of machines, the criteria of standardization of data elements and of compatibility of products were investigated also. Some conclusions and recommendations are given with the aim to assist editors of abstracting services to enhance the value of their publications through the introduction of useful features which are found in some but not all services, and the elimination of certain shortcomings. (Woodard-USGS)
W72-13820

10C. Secondary Publication AND Distribution

APPLICATION OF MODELS IN GEOHYDROLOGICAL INVESTIGATIONS,
Koninklijke Nederlandsche Heidemaatschappij, Arnhem (Netherlands).
For primary bibliographic entry see Field 02A.
W72-13731

SALMONELLA.
Defense Documentation Center, Alexandria, Va.
For primary bibliographic entry see Field 05C.
W72-13800

OIL POLLUTION OF THE MARINE ENVIRONMENT - A LEGAL BIBLIOGRAPHY,
University of Southern California, Los Angeles.
For primary bibliographic entry see Field 05G.
W72-13904

10F. Preparation of Reviews

A LITERATURE SEARCH AND CRITICAL ANALYSIS OF BIOLOGICAL TRICKLING FILTER STUDIES-VOL. I.
Dow Chemical Co., Midland, Mich. Functional Products and Systems.
For primary bibliographic entry see Field 05D.
W72-13638

A LITERATURE SEARCH AND CRITICAL ANALYSIS OF BIOLOGICAL TRICKLING FILTER STUDIES - VOL II.
Dow Chemical Co., Midland, Mich. Functional Products and Systems.
For primary bibliographic entry see Field 05.
W72-13639

REVIEW OF GEOHYDROLOGICAL ACTIVITIES IN THE NETHERLANDS SINCE WORLD WAR II, IN PARTICULAR OF THE GOVERNMENT INSTITUTE FOR WATER SUPPLY,
Rijksinstituut voor Drinkwatervoorziening, The Hague (Netherlands).
For primary bibliographic entry see Field 02F.
W72-13721

A REVIEW OF THE METHODS FOR THE IDENTIFICATION OF PERSISTENT HYDROCARBON POLLUTANTS ON SEAS AND BEACHES,
Shell Research Ltd., Chester (England). Thornton Research Center.
For primary bibliographic entry see Field 05A.
W72-13766

SUBJECT INDEX

2-AMINO-4-METHYLTHIAZOLE
2-Amino-4-Methylthiazole as a Reagent for the Gravimetric Determination and Extraction of Mercury (II),
W72-13812 5A

2-CARBETHOXY-5-HYDROXY-1-(4-TOLYL)-4-PYRIDONE
Solvent Extraction and Separation of Zirconium, Niobium and Tantalum by 2-Carbethoxy-5-Hydroxy-1- (4-Tolyl)-4-Pyridone,
W72-13807 5A

ABSORPTION
Adsorption-Desorption Equilibria of Some Radionuclides in Sediment-Freshwater and Sediment-Seawater Systems,
W72-13974 5B

The Kinetics of Water Absorption in Stratifying and Nonstratifying Noble Fir (Abies Procera Rehd.) Seeds,
W72-14099 2I

The Effect of Light and Humidity on Absorption and Degradation of Diphenamid in Tomatoes,
W72-14125 3F

ABSTRACT SERVICES
A Survey of Indexing and Abstracting Services for Water Resources Engineering,
W72-13820 10B

ABSTRACTS
A Survey of Indexing and Abstracting Services for Water Resources Engineering,
W72-13820 10B

ACETYLACETONATES
Spectrophotometric Determination of Trace Quantities of Iron (III) by an Exchange Reaction with Metal Acetylacetonates,
W72-13793 5A

ACIDITY
Loss of Viability by Staphylococcus Aureus in Acidified Media. I., Inactivation by Several Acids, Mixtures of Acids, and Salts of Acids,
W72-13777 5C

ACTIVATED SLUDGE
Control System for Waste Water Treatment Plants,
W72-13895 5D

ACTIVE TRANSPORT
Research on Ion Transport Across Microbial Membranes,
W72-14084 3A

ADENOSINE TRIPHOSPHATASE
DDT: Inhibition of Sodium Chloride Tolerance by the Blue-Green Alga Anacystis Nidulans,
W72-13809 5C

ADMINISTRATIVE AGENCIES
Natural Resources and Recreation Agencies, 1971 Annual Report.
W72-13945 6E

ADSORPTION
Adsorption-Desorption Equilibria of Some Radionuclides in Sediment-Freshwater and Sediment-Seawater Systems,
W72-13974 5B

Studies on the Behaviours and Distribution of Radioactive Substances in Coastal and Estuarine Waters,
W72-13976 5B

The Persistence of Endosulfan in Surface Water,
W72-14193 5B

AEDES
Eggs of Floodwater Mosquitoes: XIV. Northern Aedes (Diptera: Culicidae),
W72-14415 2I

AERATED LAGOONS
Process Modeling of Biological Waste Treatment,
W72-13694 5D

AERATION
Liquid Treating Apparatus,
W72-13878 5D

Acceleration Units,
W72-13880 5D

Vacuum Distillation Process and Apparatus with Direct Air Contact Condensing for Desalination of Water,
W72-13882 3A

Control System for Waste Water Treatment Plants,
W72-13895 5D

Method and Apparatus for Use in the Activated Sludge Treatment of Sewage,
W72-13901 5D

Method and Apparatus for Treating Water,
W72-13902 5D

AERIAL PHOTOGRAPHY
The Use of Aerial Photos in Pedological Cartography of the Area of Transition Between the Tropical Forest and Savanna in the Central Ivory Coast,
W72-14129 7B

AFTERBAYS
Calculation of Rate of Extension of Ice Cover in Afterbays of Reservoirs (Raschet nastupleniya kromki ledyanogo pokrova v nizhikh b'yefakh vodokhranilishch),
W72-14033 2C

AGE
Tilapia Fishery in Lake Maruit: Age and Growth of Tilapia Nilotica L. In The Lake,
W72-14000 2H

AGE DETERMINATION
Growth of Known Age Muskellunge (Esox Masquinongy) in Wisconsin and Validation of Age and Growth Determination Methods,
W72-14110 2I

AGRICULTURAL WATERSHEDS
Evaluation of a Deterministic Model for Predicting Water Yields from Small Agricultural Watersheds in Virginia,
W72-13824 2A

AGRICULTURE
Problems in the Heat and Water Regime of Agricultural Lands (Voprosy teplovogo i vodnogo rezhima sel'skokhozyaystvennykh poley).
W72-13858 3F

AGROMETEOROLOGY
Problems in the Heat and Water Regime of Agricultural Lands (Voprosy teplovogo i vodnogo rezhima sel'skokhozyaystvennykh poley).
W72-13858 3F

AGRONOMY
Simultaneous Determination of Short-Period Photosynthesis and Evapotranspiration,
W72-14009 3F

AIR COMPRESSORS
Preliminary Observations of Superintensive Fish Culture in the Beith-Shean Valley in 1969-1970,
W72-14111 8I

AIR POLLUTION
Sulfuric Acid: Its Potential for Improving Irrigation Water Quality,
W72-13920 5G

Tentative Evaluation of Industrial Damage in Stands of the Golonog Forest District,
W72-14095 5C

On Nitrogen Forms in Dew or Frost Water: II. On the Changes of Nitrogen Dioxide in the Air, (In Japanese),
W72-14186 5B

AIRBORNE INSTRUMENTATION
Apparatus for Measuring Properties of a Fluid Body from an Airborne Vehicle,
W72-13876 7B

ALABAMA
Hydrology of Alabama Areas--Cooperative Gulf of Mexico Estuarine Inventory,
W72-13840 5B

Water for Alabama, The Alabama Water-Resources Spectrum--Second Progress Report,
W72-14024 5G

ALASKA
The Biodegradation of Organic Substrates Under Arctic and Subarctic Conditions,
W72-13822 5C

Flood Plain Information, Talkeetna River-Susitna River-Chulitna River, Talkeetna, Alaska.
W72-13836 4A

Distribution Patterns for Some Particulate and Dissolved Trace Metals Within an Active Glacial Fjord,
W72-13973 5B

River Discharge into an Ice-Covered Ocean and Related Sediment Dispersal, Beaufort Sea, Coast of Alaska,
W72-14020 2J

Growth of a Talus Cone in the Western Chugach Mountains, Alaska,
W72-14026 2J

Northerly Localities for Three Aquatic Plants, Lemna Trisulca L., Ceratophyllum Demersum L., and Myriophyllum Spicatum L.,
W72-14141 2I

ALDRIN
Ozonation Reactions of Selected Pesticides for Water Pollution Abatement,
W72-13685 5G

Chlorinated Hydrocarbon, Microparticulate Effects on Microorganisms Isolated from Lake Erie,
W72-13999 5C

ALGAE
Development of a Theoretical Seasonal Growth Response Curve of Cladophora Glomerata to Temperature and Photoperiod,
W72-13651 5C

Nutrient Studies in Texas Impoundments,
W72-13692 5C

ALGAL CONTROL
A Study of Phosphate Induced Algal Growth in Order to Suppress or Eliminate this Phenomenon,
W72-13992 5A

ALGAL GROWTH
A Study of Phosphate Induced Algal Growth in Order to Suppress or Eliminate this Phenomenon,
W72-13992 5A

ALGAL NUTRIENTS
A Study of Phosphate Induced Algal Growth in Order to Suppress or Eliminate this Phenomenon,
W72-13992 5A

ALGAL POISONING
Comparative Effects of Aquatic Biotoxins on Cardiac Systems,
W72-14056 5C

ALGAL TOXINS
Comparative Effects of Aquatic Biotoxins on Cardiac Systems,
W72-14056 5C

ALIPHATIC HYDROCARBONS
Growth of Endomycopsis Lipolytica on Hydrocarbons,
W72-13817 5A

ALKALI METALS
Voltammetry in Methanol, Ethanol, and Sulfolane as Solvents,
W72-13794 5A

ALKALINE SOILS
Sulfuric Acid: Its Potential for Improving Irrigation Water Quality,
W72-13920 5G

ALLELOPATHY
Allelopathy Among the Aquatic Plants,
W72-14130 2I

ALLER RIVER (SAXONY)
Water Plant Communities in Eastern Lower Saxony (I and II), (In German),
W72-14117 5C

ALLUVIAL CHANNELS
Buried Channel Aquifers and Present Open Drainage System of East Gelderland, The Netherlands,
W72-13722 2F

Permeability Distribution in a Holocene Distributary Channel-Fill Near Leerdam (The Netherlands),
W72-13730 2J

Alluvial Cutoff Dating from Subsequent Growth of a Meander,
W72-14025 2J

ALLUVIAL FANS
Prehistoric Near-Surface Subsidence Cracks in Western Freshno County, California,
W72-13717 2E

ALLUVIAL PLAINS
Origin of Saline Soils and Their Regime, Volume 2,
W72-14041 3C

ALTERNATIVE PLANNING
Future Water Use Model of Utah Valley,
W72-13928 4A

ALUMINUM COAGULANT
Removal of Impurities from Trickling Filter Effluents by Coagulation,
W72-13826 5D

AMBARO BAY
The Hydrological Conditions of Ambaro Bay (Northwestern Madagascar): Contribution to the Study of a Tropical Eutrophic Bay, (In French),
W72-14182 5C

AMINO ACIDS
A New Reagent for Detecting Tryptophan, Indole, and Indole-3-Acetic Acid in Thin-Layer Chromatography,
W72-13773 5A

ANACYSTIS NIDULANS
DDT: Inhibition of Sodium Chloride Tolerance by the Blue-Green Alga Anacystis Nidulans,
W72-13809 5C

ANAEROBIC CONDITIONS
A Re-Evaluation of the Anaerobic Endproducts of Freshwater Fish Exposed to Environmental Hypoxia,
W72-14093 5C

ANALOG MODELS
Electric Analog Studies of Flow to Wells in the Punjab Aquifer of West Pakistan,
W72-13735 2F

ANALYTICAL TECHNIQUES
A Review of the Methods for the Identification of Persistent Hydrocarbon Pollutants on Seas and Beaches,
W72-13766 5A

Problems in Hydrologic Instrumentation (Voprosy gidrologicheskogo priborostroyeniya).
W72-13859 7B

Techniques and Hydrulic Verification of Hydrometric Studies (Metodika i gidravlicheskoye obosnovaniye gidrometricheskikh rabot).
W72-13861 8B

ANCHORED TOWERS
A Study of Anchorages for Transmission Tower Foundations,
W72-13750 8C

ANIMAL PHYSIOLOGY
Effects of Temperature on the Respiratory Metabolism of Three Chesapeake Bay Bivalves,
W72-13997 5C

ANION EXCHANGE
Process for Treating Water with a Polyhalide Resin Using a Semipermeable Membrane Barrier,
W72-13887 5F

ANISOTROPY
Permeability Distribution in a Holocene Distributary Channel-Fill Near Leerdam (The Netherlands),
W72-13730 2J

Transformation of the Tensor Form of Darcy's Law in Inhomogeneous and Anisotropic Soils,
W72-14055 2F

ANOMALOUS WATER
Anomalous Water,
W72-13842 1B

ANTI TRANSPIRANTS
Studies on the Mechanisms of Action of the Antitranspirant Phenylmercuric Acetate, and its Penetration into the Mesophyll,
W72-14149 2I

ANTIRRHINUM-MAJUS-D
Transpiration of Antirrhinum Majus L. 'Panama' as Influenced by Soil Temperature,
W72-14102 2D

APLODINOTUS-GRUNNIENS
Evaluation of Intensive Freshwater Drum (Aplodinotus Grunniens) Removal in Lake Winnebago, Wisconsin, 1955-1966,
W72-14109 2H

APPLE-D
The Effect of Fruiting Upon Transpiration Rate and Stomatal Opening in Apple Leaves,
W72-14097 3F

APPLES-D
The Quality of 'Red Delicious' Apples as Affected by Overtree Sprinkler Irrigation,
W72-14103 3F

APPLICATION METHODS
Review of California's Regional Water Supply Systems and Possible Applications of Desalting,
W72-13917 3B

AQUATIC ALGAE
Comparative Effects of Aquatic Biotoxins on Cardiac Systems,
W72-14056 5C

AQUATIC ANIMALS
Data on the Ecology and Geographical Distribution of the Testaceans of the Area of the Future Dam Lake at Iron Gate,
W72-13755 2I

W72-13864 5C

Strontium-90 and Cesium-137 in Canned Seafood, Taiwan, Republic of China, 1970-1971,
W72-13990 5A

AQUATIC ENVIRONMENT
Olfaction in Parent Stream Selection by the Alewife (Alosa pseudoharengus),
W72-13675 2I

Concentrations of Zinc-65 in Marine Foodstuffs and Pacific Coastal Residents,
W72-13979 5B

AQUATIC LIFE
Mussels and Barnacles as Indicators of the Variation of Manganese-54, Cobalt-60 and Zinc-65 in the Marine Environment,
W72-13978 5B

AQUATIC ORGANISMS
Study of Environmental Impacts of Alternative Long Island Sound Bridge Sites,
W72-13907 6G

AQUATIC PLANTS
Variations in Oxygen Consumption by Aquatic Macrophytes in a Changing Environment,
W72-13646 5C

Allelopathy Among the Aquatic Plants,
W72-14130 2I

Northerly Localities for Three Aquatic Plants, Lemna Trisulca L., Ceratophyllum Demersum L., and Myriophyllum Spicatum L.,
W72-14141 2I

AQUATIC PRODUCTIVITY
Influences of Thermal Effluents Upon Aquatic Production in Lake Ontario,
W72-13642 5C

AQUEOUS SOLUTIONS
Analytical Uses of Charge-Transfer Complexation: Spectrophotometric Method for Iodide in Water,
W72-13792 5A

Versatile Colorimetric Coulometer,
W72-13802 2K

2-Amino-4-Methylthiazole as a Reagent for the Gravimetric Determination and Extraction of Mercury (II),
W72-13812 5A

Chemical Factors that Influence the Availability of Iron and Manganese in Aqueous Systems,
W72-14022 5B

AQUICULTURE
Growth of the Fathead Minnow (Pimephales Promelas) in Tertiary Treatment Ponds,
W72-13868 5C

AQUIFER CHARACTERISTICS
Test-Observation Well Near Davenport, Washington: Description and Preliminary Results,
W72-13733 4B

Electric Analog Studies of Flow to Wells in the Punjab Aquifer of West Pakistan,
W72-13735 2F

Ground-Water Outflow from Chino Basin, Upper Santa Ana Valley, Southern California,
W72-13838 2F

Ground-Water Occurrence in the Maryland Piedmont,
W72-13848 2F

Digital Computer Modeling of Limestone Groundwater Systems,
W72-14001 2F

Groundwater Resources of Saline County, Missouri,
W72-14011 2F

Development of Ground Water in the El Paso District, Texas, 1963-70,
W72-14029 2F

AQUIFERS
Buried Channel Aquifers and Present Open Drainage System of East Gelderland, The Netherlands,
W72-13722 2F

General Ground-Water Quality in Fresh-Water Aquifers of Delaware,
W72-13832 5B

Geology and Ground Water, University of Delaware, Newark, Delaware,
W72-13833 4B

Sea Water Intrusion: Morro Bay Area, San Luis Obispo County,
W72-13846 2L

ARAZATE
Arazate Method for Estimating Copper in Water,
W72-14191 5A

ARBITRARY CARTESIAN COORDINATE SYSTEM
Transformation of the Tensor Form of Darcy's Law in Inhomogeneous and Anisotropic Soils,
W72-14055 2F

ARCHAEOLOGY
Man--The Desert Farmer,
W72-13919 3F

ARCTIC
Oil and the Ecology of the Arctic,
W72-14188 5C

ARID LAND
The Recreational Value of a Small Reservoir in an Arid Environment,
W72-13994 6D

ARID LANDS
Politics and the Colorado River,
W72-13915 6E

Man--The Desert Farmer,
W72-13919 3F

Sulfuric Acid: Its Potential for Improving Irrigation Water Quality,
W72-13920 5G

Water and Some Nutrients Losses by Deep Percolation as Influenced by the Depth of Water Table,
W72-13923 2G

ARID ZONES
Sprinkle and Trickle Irrigation of Green Pepper in an Arid Zone,
W72-14089 3F

ARIZONA
Man--The Desert Farmer,
W72-13919 3F

The Recreational Value of a Small Reservoir in an Arid Environment,
W72-13994 6D

Development of Forest Management Practices for Increasing Snowpack Water Yield,
W72-13995 2C

Use of Forest Attributes in Snowpack Inventory - Prediction Relationships for Arizona Ponderosa Pine,
W72-13996 2C

Longitudinal Profiles of Ephemeral Streams in Southeastern Arizona,
W72-14021 2E

ARKANSAS
Use of Water in Arkansas, 1970,
W72-14028 6D

Air Code and Water Quality Criteria for Interstate Streams for State of Arkansas.
W72-14044 6E

ARSENIC COMPOUNDS
Variation in the Toxicity of Arsenic Compounds to Microorganisms and the Suppression of the Inhibitory Effects by Phosphate,
W72-13813 5C

ARTIFICIAL RECHARGE
Fresh Water Winning and Salt Water Encroachment in the Amsterdam Dune Water Catchment Area,
W72-13724 4B

Experimental Injection of Tertiary-Treated Sewage in a Deep Well at Bay Park, Long Island, N. Y.--A Summary of Early Results,
W72-13839 5B

ASSAY
Anomalous Th228/Th232 and Th230/232 Activity Ratios in Backwater Sediments Along the West Coast of India.
W72-13982 5B

The Concentrations of Cadmium, Copper, Iron, Manganese, Molybdenum, Nickel, Vanadium and Zinc in Part of the Tropical Northeast Atlantic Ocean,
W72-13985 5A

Radiation Data, (Section II - Water).
W72-13988 5A

Radiation Data, (Section II - Water).
W72-13989 5A

Strontium-90 and Cesium-137 in Canned Seafood, Taiwan, Republic of China, 1970-1971,
W72-13990 5A

ATLANTIC OCEAN
Atlantic Continental Shelf and Slope of the United States-Petrology of the Sand Fraction of Sediments, Northern New Jersey to Southern Florida,
W72-13830 2J

Concentrations and Distributions of Long-Lived Fallout Radionuclides in Open Ocean Sediments,
W72-13980 5B

The Concentrations of Cadmium, Copper, Iron, Manganese, Molybdenum, Nickel, Vanadium and Zinc in Part of the Tropical Northeast Atlantic Ocean,
W72-13985 5A

ATMOSPHERE
Electricity of Clouds,
W72-14039 2B

ATMOSPHERIC PHYSICS
Four-Dimensional World-Wide Atmospheric Models (Surface to 25 Km Altitude),
W72-13843 2B

Use of Zaytsev Method for Determining the Water Content of Fogs in Chambers,
W72-13863 7B

ATOMIC ABSORPTION SPECTROPHOTOMETRY
Nickel Pollution,
W72-13778 5A

ATTITUDES
A Survey of Housewives' Attitudes,
W72-13664 5C

AUSTRALIAN FROG
Studies on Anuran Water Balance: II. Desiccation in the Australian Frog, Notaden Bennetti,
W72-14133 2I

AUTOMATION
An Automated Liquid Chromatographic Method for the Determination of Tetracycline Antibiotics,
W72-13669 5A

Variation of Precision with Time for Autoanalyzer Data,
W72-13763 7B

On-Line Computer-Controlled Electrical Detection in Spark Source Mass Spectrometry,
W72-13770 7B

AVAILABLE WATER CAPACITY
Soil Suitability for Spray Irrigation,
W72-13706 5D

BACTERIA
Effect of Mineral Particulates on Microbial Degradation of Solid Organic Materials,
W72-13645 5C

Size Distribution of Bacterial Cells,
W72-13667 5A

The Quantimet 720P for Routine Biological Assay and Potency Calculation from Colony Count, Inhibition and Exhibition Zone Measurements,
W72-13762 5B

Method and Means for Detecting Coliform Bacteria in Water,
W72-13881 5A

Chlorinated Hydrocarbon, Microparticulate Effects on Microorganisms Isolated from Lake Erie,
W72-13999 5C

Functional Model of the Lake Ecological System (In Russian),
W72-14167 5C

BACTERIAL BLIGHT
Perpetuation of Bacterial Blight Disease of Paddy and Preservation of Its Incitant: I. Survival of Xanthomonas Oryzae in Water,
W72-14118 5C

BACTERIOPHAGE
Virus Rem Oval by Chemical Coagulation,
W72-13684 5D

BAGRIDAE
A Guide to the External Sexing of Some West African Freshwater Fishes,
W72-14145 2I

BALTIC SEA
Estimating the Wetting of Walls by Driving Rain (Ob otsenke uvlazheniya sten pri kosykh dozhydakh),
W72-13855 7B

New Investigations of Shore Processes (Novyye issledovaniya beregovykh protsessov).
W72-14036 2J

BANK PROTECTION
Red River Waterway and Red River Waterway Emergency Bank Protection, Mississippi River to Vicinity of Index, Arkansas, Louisiana, Arkansas, Oklahoma, and Texas (Draft Environmental Impact Statement).
W72-13952 8A

BARENTS SEA
Estimating the Wetting of Walls by Driving Rain (Ob otsenke uvlazheniya sten pri kosykh dozhydakh),
W72-13855 7B

BARIUM
Voltammetry in Methanol, Ethanol, and Sulfolane as Solvents,
W72-13794 5A

BARIUM BICARBONATE
Direct Contact Desulfation Laboratory and Pilot Plant Development Study for Softening of Sea Water,
W72-14065 3A

BASALTS
Weathering of Basaltic Tephra on the Island of Hawaii,
W72-14014 2J

BASE LEVEL OF EROSION
Development of the Gauya River Valley (Razvitiye doliny reki Gauya),
W72-14034 2J

BASELINE STUDIES
The River Wear: Inorganic Chemistry Relevant to a Biologist,
W72-13866 2K

BASIC DATA COLLECTIONS
Surface Water Supply of the United States, 1961-65, Part 1. North Atlantic Slope Basins--Volume 2. Basins from New York to Delaware.
W72-13827 7C

Suspended Sediment Data Summary March 1966-May 1967, Upper Chesapeake Bay (Tolchester to Havre De Grace),
W72-13849 2L

Ground-Water Conditions in Utah, Spring of 1972,
W72-14023 4B

Records of Wells in Harris County, Texas, 1892-1972,
W72-14027 4B

Indiana Water Quality, 1969, Monitor Station Records--Rivers and Streams.
W72-14045 7B

BASINS
Riprapped Basins for Culvert Outfalls,
W72-13751 8A

BASS
Harvest and Feeding Habitats of Largemouth Bass (Micropterus Salmoides) in Murphy Flowage, Wisconsin,
W72-14114 8I

BATHYTHERMOGRAPHS
Apparatus for Measuring Properties of a Fluid Body from an Airborne Vehicle,
W72-13876 7B

BATON ROUGE (LA)
The Genesis of Selected Hydrochemical Facies in Baton Rouge, Louisiana, Ground Waters,
W72-14008 2F

BAY OF FUNDY
Salinity Tolerances of Some Common Prosobranchs,
W72-13795 5C

BEACHES
Inverse Relation Between Foreshore Slope and Mean Grain Size as a Function of the Heavy Mineral Content,
W72-14016 2J

BEAMS (STRUCTURAL)
Column Load Influence on Reinforced Concrete-Beam Column Connection,
W72-13748 8F

Short-Time Deflections of Beams Under Single and Repeated Load Cycles,
W72-13749 8F

BEARINGS
Why Rock-Bit Bearings Fail,
W72-13632 8G

BEAUFORT SEA
River Discharge into an Ice-Covered Ocean and Related Sediment Dispersal, Beaufort Sea, Coast of Alaska,
W72-14020 2J

BEET-D
Effects of Cultural Practices and Fertilizers on Sugar Beet Quality,
W72-14139 5C

BEITH-SHEAN VALLEY (ISRAEL)
Preliminary Observations of Superintensive Fish Culture in the Beith-Shean Valley in 1969-1970,
W72-14111 8I

BELGIUM
Ecologic Study of Two Small Ponds in the Environs of Wevelgem (West Flanders),
W72-14187 5C

BENEFITS
Recreation Benefit Estimation and Forecasting: Implications of the Identification Problem,
W72-13934 6A

BENTHIC STREAMS
Efficiency of Sucrose Flotation in Recovering Insect Larvae From Benthic Stream Samples,
W72-14116 2I

BIBLIOGRAPHIES
A Literature Search and Critical Analysis of Biological Trickling Filter Studies-Vol. I.
W72-13638 5D

A Literature Search and Critical Analysis of Biological Trickling Filter Studies - Vol II.
W72-13639
Application of Models in Geohydrological Investigations,
W72-13731 2A

Salmonella.
W72-13800 5C

A Survey of Indexing and Abstracting Services for Water Resources Engineering,
W72-13820 10B

Oil Pollution of the Marine Environment - A Legal Bibliography,
W72-13904 5G

BICARBONATES
The Genesis of Selected Hydrochemical Facies in Baton Rouge, Louisiana, Ground Waters,
W72-14008 2F

BIG BEAR LAKE (CALIF)
Limnological Studies of Big Bear Lake, California,
W72-13739 5C

BIG ROCK POINT (MICH.)
Radioactivity in Lake Michigan Water and Biota Vicinity of Big Rock Point Nuclear Reactor, 1960-69,
W72-13656 5C

Radionuclide Concentrations Near the Big Rock Point Nuclear Power Station,
W72-13661 5C

BIOACCUMULATION
Chronic Exposure of Rats to Methyl Mercury in Fish Protein,
W72-13780 5C

BIOASSAY
Determination of Diethylstilbestrol in Cattle Tissues,
W72-13677 5A

The Quantimet 720P for Routine Biological Assay and Potency Calculation from Colony Count, Inhibition and Exhibition Zone Measurements,
W72-13762 5B

Activity Response to Chlorine in the Brook Trout, Salvelinus Fontinalis (Mitchell),
W72-13867 5C

Mortality of Pacific Oysters (Crassotrea GI-Gas): The Influence of Temperature and Enriched Seawater on Oyster Survival,
W72-13875 5C

BIOCHEMICAL OXYGEN DEMAND
Swine Waste Characterization and Evaluation of Animal Waste Treatment Alternatives,
W72-13635 5D

A Probabilistic Analysis of Dissolved Oxygen-Biochemical Oxygen Demand Relationship in Streams,
W72-13688 5B

Higher BOD Removal Via Chemical Additives.
W72-13689 5D

BIODEGRADATION
Biodegradation of Synthetic Detergents Evaluation by Community Trials: 1. Linear Alkylbenzene Sulfonates,
W72-13703 5D

The Biodegradation of Organic Substrates Under Arctic and Subarctic Conditions,
W72-13822 5C

Radiation Treatment of Materials,
W72-13883 5D

The Biodegradation of Oil in Seawater for Naval Pollution Control,
W72-14012 5B

Biological Degradation of Cellulose Acetate Reverse Osmosis Membranes,
W72-14079 3A

BIOINDICATORS
Method and Means for Detecting Coliform Bacteria in Water,
W72-13881 5A

BIOLOGICAL COMMUNITIES
Thermal Effluents from Electrical Power Generation,
W72-13905 5C

Fish and Wildlife in the Marine and Coastal Zone, Part A, Summary Planning Information, and Recommendations,
W72-13908 6G

BIOLOGICAL DENITRIFICATION
Biological Denitrification Using Fluidized Granular Beds,
W72-14047 5D

BIOLOGICAL MATERIALS
Method for Determination of Mercury in Biological Materials by Neutron Activation Analysis,
W72-13788 5A

BIOLOGICAL MEMBRANES
Research on Ion Transport Across Microbial Membranes,
W72-14084 3A

BIOLOGICAL PROPERTIES
Marin Environmental Quality, Suggested Research Programs for Understanding Man's Effect on the Oceans.
W72-13903 5A

BIOLOGICAL SAMPLES
A Modified Plastic Bag Combustion Technique for the Radioassay of C-14 and H-3 in Biological Tissues,
W72-13670 5A

A Technique for Curie Point Pyrolysis Gas Chromatography of Complex Biological Samples,
W72-13761 5A

Rapid Method for Detection and Characterization of Steroids,
W72-13781 5A

BIOLOGICAL TREATMENT
A Literature Search and Critical Analysis of Biological Trickling Filter Studies-Vol. I.
W72-13638 5D

A Literature Search and Critical Analy... of Biological Trickling Filter Studies - Vol II.
W72-13639
Process Modeling of Biological Waste Treatment,
W72-13694 5D

Liquid Treating Apparatus,
W72-13878 5D

Sewage Treatment Apparatus and Method,
W72-13893 5D

BIOMASS
Dynamics of Phytoplankton Primary Production and Biomass in Loviisa Archipelago (Gulf of Finland),
W72-13871 5C

BIOTA
Radioactivity in Lake Michigan Water and Biota Vicinity of Big Rock Point Nuclear Reactor, 1960-69,
W72-13656 5C

BIOTOXINS
Comparative Effects of Aquatic Biotoxins on Cardiac Systems,
W72-14056 5C

BIRDS
Notes on the Avifauna of the Marshy Area of Pierrepont-Sissonne (Laonnois-Aisne) II,
W72-13678 5C

Seasonal Variations in the Avifauna Composition of the Lavours Swamp (AIN),
W72-13799 2I

Study of Environmental Impacts of Alternative Long Island Sound Bridge Sites,
W72-13907 6G

BIT SCAVENGING
Ability of Drilling Mud to Lift Bit Cuttings,
W72-13629 8B

BIT WEIGHT
How Rotary Speed and Bit Weight Affect Rotary Drilling Rate,
W72-13631 8C

BLACK SEA
New Investigations of Shore Processes (Novyye issledovaniya beregovykh protsessov).
W72-14036 2J

BLUEGILL SUNFISH
Use of Ultraviolet Light to Increase the Availablity of Aerial Insects to Caged Bluegill Sunfish,
W72-14140 2I

BOD5
Swine Waste Characterization and Evaluation of Animal Waste Treatment Alternatives,
W72-13635 5D

BOGS
Chronology of a Kettle-Hole Peat Bog, Cherryfield, Maine,
W72-14019 2J

BOMBAY CATFISH
Observations on the Food and Feeding Behavior of the Common Bombay Catfish: Tachysurus S ona (HAM),
W72-14143 2I

BOMBAY (INDIA)
Anomalous Th228/Th232 and Th230/232 Activity Ratios in Backwater Sediments Along the West Coast of India.
W72-13982 5B

BOREHOLE GEOPHYSICS
Recent Developments of Physical Investigations in Boreholes and Wells,
W72-13727 4B

BORON
Spectrophotometric Method for Determining Low Levels of Water-Soluble Boron in Fertilizers,
W72-13782 5A

Determination of Submicrogram Amounts of Boron Using the B-10 (n, alpha) Li-7 Reaction,
W72-13784 5A

BOUNDARIES (SURFACES)
Hydrodynamics of Free-Boundary Flows,
W72-14040 8B

BOUNDARY PROCESSES
Hydrodynamics of Free-Boundary Flows,
W72-14040 8B

BOUNDARY WATERS TREATY
Signing of Great Lakes Water Quality Agreement, April 15.
W72-13947 5G

BOWEN-RATIO DETERMINATION
Psychrometric Apparatus for Bowen-Ratio Determination Over Forests,
W72-14184 7B

BREAKWATERS
Lorain Harbor, Ohio (Maintenance) (Draft Environmental Impact Statement).
W72-13962 4A

BREEDING BIRDS
Notes on a Rhodesian Colony of the Red Bishop,
W72-14142 2I

BREMSSTRAHLUNG COUNTING
Detection and Measurement of Tritium by Bremsstrahlung Counting,
W72-13679 5A

BRIDGE CONSTRUCTION
Study of Environmental Impacts of Alternative Long Island Sound Bridge Sites,
W72-13907 6G

BRINE DISPOSAL
Exploratory Study of Brine Disposal Using Fluid-Bed Evaporation,
W72-14063 5E

Model Studies of Outfall Systems for Desalination Plants (Part II - Estuary Models),
W72-14064 5B

Disposal of Brine by Solar Evaporation,
W72-14077 2D

A Study of the Disposal of the Effluent from a Large Desalination Plant,
W72-14086 5B

BRINES
Exploratory Study of Brine Disposal Using Fluid-Bed Evaporation,
W72-14063 5E

Disposal of Brine by Solar Evaporation,
W72-14077 2D

A Study of the Disposal of the Effluent from a Large Desalination Plant,
W72-14086 5B

BRITISH COLUMBIA
Thermal Effluents from Electrical Power Generation,
W72-13905 5C

BROOK TROUT
Activity Response to Chlorine in the Brook Trout, Salvelinus Fontinalis (Mitchell),
W72-13867 5C

Responses of a Brook Trout (Salvelinus Fontinalis) Population to Habitat Development in Lawrence Creek,
W72-14108 8I

BROWNSVILLE (TEX)
Proposed Hybrid Prototype Desalting Plant for Brownsville, Texas (Draft Environmental Impact Statement).
W72-13958 3A

BURBOT
Aspects of the Nutritive Dynamics and Trophic Relationships of the Burbot (Lota Lota Lota L.) in the Upper Mures River, (In Rumanian),
W72-14127 2H

BURIED VALLEYS
Buried Channel Aquifers and Present Open Drainage System of East Gelderland, The Netherlands,
W72-13722 2F

BUTANE
Freezing Process Studies,
W72-14070 3A

C-14
A Modified Plastic Bag Combustion Technique for the Radioassay of C-14 and H-3 in Biological Tissues,
W72-13670 5A

CADMIUM
The Concentrations of Cadmium, Copper, Iron, Manganese, Molybdenum, Nickel, Vanadium and Zinc in Part of the Tropical Northeast Atlantic Ocean,
W72-13985 5A

CALANOIDA
The Decline of the Large Zooplankter, Limnocalanus Macrurus Sars (Copepoda: Calanoida), in Lake Erie,
W72-13643 5C

CALCAREOUS SOILS
Inorganic Phosphate Fractions in Calcareous Soils in Relation to Moisture and Incubation Period,
W72-14189 2G

CALFIORNIA
Dynamic Multisector Programming Approach to Regional Water Resource Management,
W72-13933 6A

CALIF
Operation of Reverse Osmosis Pilot Plants,
W72-14074 3A

CALIFORNIA
Prehistoric Near-Surface Subsidence Cracks in Western Freshno County, California,
W72-13717 2E

Water-Quality Reconnaisance of the Lower Santa Ana River Canyon, Southern California,
W72-13720 2K

Limnological Studies of Big Bear Lake, California,
W72-13739 5C

Rapid Method for Detection and Characterization of Steroids,
W72-13781 5A

A Study of Light Attenuation in Monterey Bay, California,
W72-13798 5A

Ground-Water Outflow from Chino Basin, Upper Santa Ana Valley, Southern California,
W72-13838 2F

Sea Water Intrusion: Morro Bay Area, San Luis Obispo County,
W72-13846 2L

Preliminary Report on Techniques for Marine Monitoring Systems,
W72-13850 5B

A Framework for Identification and Control of Resource Degradation and Conflict in the Multiple Use of the Coastal Zone,
W72-13906 5G

Fish and Wildlife in the Marine and Coastal Zone, Part A, Summary Planning Information, and Recommendations,
W72-13908 6G

Review of California's Regional Water Supply Systems and Possible Applications of Desalting,
W72-13917 3B

DDT Residues in Eight California Marine Fishes,
W72-13946 5B

Radiation Data, (Section II - Water).
W72-13989 5A

The Biodegradation of Oil in Seawater for Naval Pollution Control,
W72-14012 5B

California High Water, 1969-1970,
W72-14013 2E

A Review of Pesticide Monitoring Programs in California.
W72-14043 7B

Harvest, Survival, and Cost of Two Domestic Strains of Tagged Rainbow Trout Stocked in Lake Berryessa, California,
W72-14181 2H

CANADA
A Survey of Housewives' Attitudes,
W72-13664 5C

Permafrost in Canada.
W72-13831 7C

Northerly Localities for Three Aquatic Plants, Lemna Trisulca L., Ceratophyllum Demersum L., and Myriophyllum Spicatum L.,
W72-14141 2I

CANYONS
Nonantecedent Development of Truckee River Canyon, Northern Carson Range, Nevada and California,
W72-14015 2J

CAPILLARY ACTION
Perturbation Analysis of Two-Phase Infiltration,
W72-14006 2G

Use of Capillary Columns to Study Infiltration of Water Into Frozen Soil (Skhema kapillyarnykh kolonn dlya vpityvaniya vody v merzlyy grunt),
W72-14031 2G

CAPILLARY CONDUCTIVITY
Use of Capillary Columns to Study Infiltration of Water Into Frozen Soil (Skhema kapillyarnykh kolonn dlya vpityvaniya vody v merzlyy grunt),
W72-14031 2G

CAPTATION AREA
Hydrogeological Studies in the Captation Area of the Loisach River Between Garmisch-Partenkirchen and Eschenlohe/OBB,
W72-14148 2E

CARBON DIOXIDE
Direct Contact Desulfation Laboratory and Pilot Plant Development Study for Softening of Sea Water,
W72-14065 3A

CARBON MONOXIDE
Respiratory and Circulatory Responses of Rainbow Trout Larvae to Carbon Monoxide and to Hypoxia,
W72-14146 5C

CARBON RADIOISOTOPES
The Geochemistry of Radiocarbon in the Gulf of Mexico,
W72-13981 5B

CARP
Some Haematological and Metabolic Changes in Fish Occurring After Pesticide Intoxication (Nektere Hematologicke A Metabolicke Zmenyuryb po Intoxikaci Pesticidy),
W72-13873 5C

CARRYING CAPACITY
Wheeler-Dealing: Jackpot in Hay,
W72-13921 3F

CASPIAN SEA
Reduction of Runoff Into Kara-Bogaz-Gol and the Future Level of the Caspian Sea (Ogranicheniye stoka v zaliv Kara-Bogaz-Gol i budushchiy uroven' Kaspiyskogo morya),
W72-14032 2E

CASTOR-FIBER
Present State of Castor Fiber L. Population in the Upper and Middle Flow of the Ubort River and Prospects of Its Economic Use (In Russian),
W72-14159 2I

CATALYSTS
Neutron-Activation Determination of Vanadium in Oils and Catalysts,
W72-13804 5A

CATFISH
Observations on the Food and Feeding Behavior of the Common Bombay Catfish: Tachysurus Sona (HAM),
W72-14143 2I

CATIONS
Voltammetry in Methanol, Ethanol, and Sulfolane as Solvents,
W72-13794 5A

CATTLE
Determination of Diethylstilbestrol in Cattle Tissues,
W72-13677 5A

CAYUGA LAKE (N.Y.)
Five Trace Elements and Vitamin B-12 in Cayuga Lake,
W72-13660 5C

CELL DIVISION
Synchronization of Cell Division in Escherichia Coli by Elevated Temperatures: A Reinterpretation,
W72-13666 5C

CELL MEMBRANES
Research on Ion Transport Across Microbial Membranes,
W72-14084 3A

CELLULOLYSIS
The Biodegradation of Organic Substrates Under Arctic and Subarctic Conditions,
W72-13822 5C

CELLULOSE
Cellulolytic Activity in Municipal Solid Waste Composting,
W72-13686 5B

CELLULOSE ACETATE
Biological Degradation of Cellulose Acetate Reverse Osmosis Membranes,
W72-14079 3A

CELLULOSE ACETATE MEMBRANES
Operation of Reverse Osmosis Pilot Plants,
W72-14074 3A

Drying Cellulose Acetate Reverse Osmosis Membranes,
W72-14078 3A

CELLULOSE ACTIVITY
Cellulolytic Activity in Municipal Solid Waste Composting,
W72-13686 5B

CENTRAL ARIZONA PROJECT
Politics and the Colorado River,
W72-13915 6E

CESIUM
Concentrations and Distributions of Long-Lived Fallout Radionuclides in Open Ocean Sediments,
W72-13980 5B

Strontium-90 and Cesium-137 in Canned Seafood, Taiwan, Republic of China, 1970-1971,
W72-13990 5A

CHALARONDON-MADAGASCARIENSIS
Analysis of the Environmental Factors in the Area of Distribution of Chalarodon Madagascariensis: Their Biological Implications,
W72-14144 2I

CHANNEL FLOW
An Experimental Study of the Growth of Mechanically Generated Surface Water Waves When Subjected to a Fully Developed Turbulent Channel Airflow,
W72-13734 2E

Channel Network of a Basin and Formation of Runoff (Ruslovaya set' basseyna i protsess formirovaniya stoka vody),
W72-13853 2E

CHANNEL IMPROVEMENT
Red River Waterway and Red River Waterway Emergency Bank Protection, Mississippi River to Vicinity of Index, Arkansas, Louisiana, Arkansas, Oklahoma, and Texas (Draft Environmental Impact Statement).
W72-13952 8A

Kingstree Branch Flood Control Project, South Carolina (Draft Environmental Impact Statement).
W72-13960 4A

Fairport Harbor, Lake County, Ohio (Draft Environmental Impact Statement).
W72-13961 4A

Lorain Harbor, Ohio (Maintenance) (Draft Environmental Impact Statement).
W72-13962 4A

Little River Inlet, North Carolina and South Carolina, Navigation Improvements (Draft Environmental Impact Statement).
W72-13964 4A

CHANNEL MORPHOLOGY
Longitudinal Profiles of Ephemeral Streams in Southeastern Arizona,
W72-14021 2E

Alluvial Cutoff Dating from Subsequent Growth of a Meander,
W72-14025 2J

CHANNELS
Channel Network of a Basin and Formation of Runoff (Ruslovaya set' basseyna i protsess formirovaniya stoka vody),
W72-13853 2E

Seedbed Preparation and Seeding Methods to Establish Grassed Waterways,
W72-13914 4A

CHARACINIDAE
A Guide to the External Sexing of Some West African Freshwater Fishes,
W72-14145 2I

CHARACTERIZATION
Characterization of Gas Chromatographic Effluents Via Scanning Fluorescence Spectrometry,
W72-13672 5A

CHARGE-TRANSFER COMPLEXATION
Analytical Uses of Charge-Transfer Complexation: Spectrophotometric Method for Iodide in Water,
W72-13792 5A

CHARGED MEMBRANES
Transport Processes in Hyperfiltration Membranes I,
W72-14083 3A

CHELOMETRIC TITRATION
Wax-Bound Lead Dioxide Potentiometric Electrode and Applications to Chelometric Titration,
W72-13676 5A

CHEMCONTROL
Declaring War....On Mesquite,
W72-13925 3B

CHEMICAL ANALYSIS
Water-Quality Reconnaisance of the Lower Santa Ana River Canyon, Southern California,
W72-13720 2K

New Methods for Detection and Quantification in Thin-Layer Chromatography: A Study of Pyrolysis and Combustion Systems,
W72-13768 5A

Semiintegral Electroanalysis: Theory and Verification,
W72-13791 2K

Microdetermination of Carbon, Hydrogen, Nitrogen and Oxygen in Petroleum Compounds with an Automatic Elemental Analyzer,
W72-13805 5A

General Ground-Water Quality in Fresh-Water Aquifers of Delaware,
W72-13832 5B

Nitrate Contamination of the Water-Table Aquifer in Delaware,
W72-13834 5B

Hydrology of Alabama Areas--Cooperative Gulf of Mexico Estuarine Inventory,
W72-13840 5B

The Analysis of Trace Organics in Fresh Water by Gas Chromatography -- Mass Spectroscopy,
W72-14057 5A

CHEMICAL DEGRADATION
Ozonation Reactions of Selected Pesticides for Water Pollution Abatement,
W72-13685 5G

Macroreticular Resins-A Solution To Aggressive Conditions,
W72-13690 5D

CHEMICAL ELEMENTS
Microdetermination of Carbon, Hydrogen, Nitrogen and Oxygen in Petroleum Compounds with an Automatic Elemental Analyzer,
W72-13805 5A

CHEMICAL IMPURITIES
An Artifact in the Gas Chromatographic Determination of Impurities in Pentachlorophenol,
W72-13774 5A

CHEMICAL INTERFERENCE
Spectrophotometric Determination of Trace Quantities of Iron (III) by an Exchange Reaction with Metal Acetylacetonates,
W72-13793 5A

Simple Device for Compensation of Broad-Band Absorption Interference in Flameless Atomic Absorption Determination of Mercury,
W72-13803 5A

CHEMICAL PRECIPITATION
Virus Rem Oval by Chemical Coagulation,
W72-13684 5D

Higher BOD Removal Via Chemical Additives.
W72-13689 5D

Co-precipitation Applied in the Determination of Lead in Drinking Water, (In Serbo-Croatian),
W72-14179 5A

CHEMICAL PROPERTIES
W72-13655 5C

A Study of Light Attenuation in Monterey Bay, California,
W72-13798 5A

CHEMICAL REACTIONS
Determination of Submicrogram Amounts of Boron Using the B-10 (n, alpha) Li-7 Reaction,
W72-13784 5A

CHEMICAL SHIFTS
A Computerized System for Storing, Retrieving, and Correlating NMR Data,
W72-13808 7C

CHEMICAL TREATMENT
Chemical Treating Process for Sewage Systems,
W72-13899 5D

CHESAPEAKE BAY
Tidal Variation of the Suspended Sediment Size Distribution at a Station in Upper Chesapeake Bay,
W72-13837 2L

Suspended Sediment Data Summary March 1966-May 1967, Upper Chesapeake Bay (Tolchester to Havre De Grace),
W72-13849 2L

CHINA MEADOWS DAM AND RESERVOIR (WYO)
Authorized China Meadows Dam and Reservoir Lyman Project, Wyoming (Draft Environmental Impact Statement).
W72-13963 8D

CHINO BASIN (CALIF)
Ground-Water Outflow from Chino Basin, Upper Santa Ana Valley, Southern California,
W72-13838 2F

CHLORELLA
A Study of Phosphate Induced Algal Growth in Order to Suppress or Eliminate this Phenomenon,
W72-13992 5A

CHLORINATED HYDROCARBON PESTICIDES
PCBs in Fish from the Milwaukee Region,
W72-13652 5C

Metabolism of Polychlorinated Norbornenes by Clostridium butyricum,
W72-13779 5B

Identification of Organochlorine Pesticide Residues by Ultraviolet Solid-Phase Photolysis,
W72-13786 5A

Pesticide and Mercury Levels in Migrating Duck Populations,
W72-13865 5C

Chlorinated Hydrocarbon, Microparticulate Effects on Microorganisms Isolated from Lake Erie,
W72-13999 5C

CHLORINATED PESTICIDES
The Effect of Certain Chlorinated Organic Pesticides on Hygienic Indicators of Water,
W72-14164 5C

CHLORINATION
Hygienic Standardization of Phenol in Water Bodies (In Russian),
W72-14157 5F

CHLORINE
Activity Response to Chlorine in the Brook Trout, Salvelinus Fontinalis (Mitchell),
W72-13867 5C

CHLOROBIPHENYL
PCBs in Fish from the Milwaukee Region,
W72-13652 5C

CHLOROPHYLL
Distribution of Chlorophyll and Its Relation to Particulate Organic Matter in the Offshore Waters of Lake Michigan,
W72-13648 5C

Chlorophyll a - Total Phosphorus Relationships in Lake Erie,
W72-13653 5C

An Intensive Biochemical Survey of Western Lake Erie,
W72-13654 5C

A Quantitative Comparison of Pigment Extraction by Membrane and Glass-Fiber Filters,
W72-13673 5A

Sensitive Fluorescence Method for the Determination of Chlorophyll a/Chlorophyll b Ratios,
W72-13796 5A

CHLOROPHYLL A
Sensitive Fluorescence Method for the Determination of Chlorophyll a/Chlorophyll b Ratios,
W72-13796 5A

CHLOROPHYLL B
Sensitive Fluorescence Method for the Determination of Chlorophyll a/Chlorophyll b Ratios,
W72-13796 5A

CHOTANAGPUR (INDIA)
Investigations on Rainy Season Potato in the Plateau Region of Chotanagpur,
W72-14091 3F

CHROMAGENIC REAGENTS
A New Reagent for Detecting Tryptophan, Indole, and Indole-3-Acetic Acid in Thin-Layer Chromatography,
W72-13773 5A

CHROMATOGRAPHIC PEAKS
On Calculation of the Areas of Off-Chart Chromatographic Peaks Using Data Obtained with the Aid of Integrators,
W72-13769 7B

CHROMATOGRAPHY
On Calculation of the Areas of Off-Chart Chromatographic Peaks Using Data Obtained with the Aid of Integrators,
W72-13769 7B

CHROMIUM
Studies on the Determination of Physiological Levels of Chromium in Serum by Gas Chromatography,
W72-13767 5A

CHUGACH MOUNTAINS (ALASKA)
Growth of a Talus Cone in the Western Chugach Mountains, Alaska,
W72-14026 2J

CITRUS-D
A Device for Measuring and Recording the Amount and Duration of Free Water on Vegetation in the Field,
W72-14094 3F

CLADOCERA
Cladocera Studies on Lake Balaton: IV. Subfossil Remains in the Sediments of Lake Balaton II,
W72-14160 2H

CLADOPHORA
Availability of Phosphorus for Cladophora Growth in Lake Michigan,
W72-13644 5C

Development of a Theoretical Seasonal Growth Response Curve of Cladophora Glomerata to Temperature and Photoperiod,
W72-13651 5C

CLADOPHORA GLOMERATA
Development of a Theoretical Seasonal Growth Response Curve of Cladophora Glomerata to Temperature and Photoperiod,
W72-13651 5C

CLAMS
Effects of Temperature on the Respiratory Metabolism of Three Chesapeake Bay Bivalves,
W72-13997 5C

CLARIIDAE
A Guide to the External Sexing of Some West African Freshwater Fishes,
W72-14145 2I

CLASSIFICATION
Proposed Reclassifications of Certain Waters in the Broad, Catawba, French Broad, Hiwassee, Little Tennessee, New, and Watauga River Basins to be Considered at a Public Hearing to be Held on June 29, 1972, in Hickory, North Carolina.
W72-13942 5G

CLAYS
Amide-Water Interaction on Montmorillonite Surface,
W72-13916 2G

CLIMATE
Man and His Environment: Climate,
W72-14137 6G

CLOSTRIDIUM BUTYRICUM
Metabolism of Polychlorinated Norbornenes by Clostridium butyricum,
W72-13779 5B

CLOUD BURSTS
Digital Simulation of Thunderstorm Rainfall,
W72-13634 2B

CLOUD ELECTRICITY
Electricity of Clouds,
W72-14039 2B

CLOUD PHYSICS
Use of Zaytsev Method for Determining the Water Content of Fogs in Chambers,
W72-13863 7B

Electricity of Clouds,
W72-14039 2B

CLOUDS
Electricity of Clouds,
W72-14039 2B

COAGULATION
Virus Rem Oval by Chemical Coagulation,
W72-13684 5D

Removal of Impurities from Trickling Filter Effluents by Coagulation,
W72-13826 5D

COASTAL PLAINS
Digital Simulation of Thunderstorm Rainfall,
W72-13634 2B

COASTS
Sea Water Intrusion: Morro Bay Area, San Luis Obispo County,
W72-13846 2L

Topography and Recent Sediments of the Littoral Zone of Soviet Far Eastern Seas (Osobennosti formirovaniya rel'yefa i sovremennykh osadkov pribrezhnoy zony dal'nevostochnykh morey SSSR).
W72-13860 2J

A Framework for Identification and Control of Resource Degradation and Conflict in the Multiple Use of the Coastal Zone,
W72-13906 5G

Fish and Wildlife in the Marine and Coastal Zone, Part A, Summary Planning Information, and Recommendations,
W72-13908 6G

Anomalous Th228/Th232 and Th230/232 Activity Ratios in Backwater Sediments Along the West Coast of India.
W72-13982 5B

New Investigations of Shore Processes (Novyye issledovaniya beregovykh protsessov).
W72-14036 2J

COCKSFOOT-M
Reaction of Soil Fungi and Other Microorganisms to Various Levels of Nitrogen Fertilization and Irrigation of Cocksfoot (Dactylis Glomerata L.). (In Polish),
W72-14158 5C

COLIFORMS
Virus and Water Quality: Occurrence and Control.
W72-13610 5F

The Coliform Test: A Criterion for the Viral Safety of Water,
W72-13612 5F

Evaluation of Methods for Detection of Coliform Bacteria in Raw Milk,
W72-13671 5A

Method and Means for Detecting Coliform Bacteria in Water,
W72-13881 5A

COLLOIDS
The Removal of Radionuclides From Water by Hydrous Ferric Oxide,
W72-13699 5D

Removal of Impurities from Trickling Filter Effluents by Coagulation,
W72-13826 5D

COLOR
The Quality of 'Red Delicious' Apples as Affected by Overtree Sprinkler Irrigation,
W72-14103 3F

COLORADO
Selected Streamflow Characteristics as Related to Channel Geometry of Perennial Streams in Colorado,
W72-13736 2E

COLORADO RIVER BASIN
Techniques of Statistical Evaluation of Runoff Results of Precipitation Modification,
W72-13841 2A

Politics and the Colorado River,
W72-13915 6E

COLORADO RIVER BASIN PILOT PROJECT
Test of Runoff Increase Due To Precipitation Management for the Colorado River Basin Pilot Project,
W72-13912 3B

COLORADO RIVER COMPACT
Politics and the Colorado River,
W72-13915 6E

COLORIMETRY
Variation of Precision with Time for Autoanalyzer Data,
W72-13763 7B

Versatile Colorimetric Coulometer,
W72-13802 2K

COLUMBIA RIVER
Sorption-Desorption Reactions of Mercury with Suspended Matter in the Columbia River,
W72-13972 5B

Transport and Depletion of Radionuclides in the Columbia River,
W72-13975 5B

Concentrations of Zinc-65 in Marine Foodstuffs and Pacific Coastal Residents,
W72-13979 5B

Hanford Atomic Products Operation, January-December 1969.
W72-13991 5B

COLUMNS
Column Load Influence on Reinforced Concrete-Beam Column Connection,
W72-13748 8F

COMBUSTION
New Methods for Detection and Quantification in Thin-Layer Chromatography: A Study of Pyrolysis and Combustion Systems,
W72-13768 5A

COMBUSTION TECHNIQUES
A Modified Plastic Bag Combustion Technique for the Radioassay of C-14 and H-3 in Biological Tissues,
W72-13670 5A

COMMELINA-COMMUNIS-M
Studies on the Mechanisms of Action of the Antitranspirant Phenylmercuric Acetate, and its Penetration into the Mesophyll,
W72-14149 2I

COMMON LAW
The Law and the Corporate Polluter: Flexibility and Adaption in the Developing Law of the Environment,
W72-13938 5G

COMPETITION
Competition and Its Bearing on the Freshwater Faunas,
W72-14176 2I

COMPLEXATION
Complexation of Metal Ions with Natural Polyelectrolytes (Removal and Recovery of Metal Ions from Polluted Waters),
W72-13776 5A

COMPOSTING
Cellulolytic Activity in Municipal Solid Waste Composting,
W72-13686 5B

COMPUTER MODELS
Water Quality Predictions Based on Limnological Parameters,
W72-13825 5C

Four-Dimensional World-Wide Atmospheric Models (Surface to 25 Km Altitude),
W72-13843 2B

The River Basin Model: The Social Science Laboratory.
W72-13929 6A

Digital Computer Modeling of Limestone Groundwater Systems,
W72-14001 2F

Functional Model of the Lake Ecological System (In Russian),
W72-14167 5C

COMPUTER PROGRAMS
The River Basin Model: Chairman and Council.
W72-13930 6A

COMPUTERS
On-Line Computer-Controlled Electrical Detection in Spark Source Mass Spectrometry,
W72-13770 7B

CONCENTRATION POLARIZATION
Control of Concentration Polarization in Reverse Osmosis Desalination of Water,
W72-14080 3A

CONCRETE MIXES
Factors Affecting the Flexural Strength of Steel Fibrous Concrete,
W72-13754 8F

CONCRETE TECHNOLOGY
Microcracking Effect on Flexural Strength of Concrete After Repeated Loading,
W72-13744 8F

CONCRETE TESTING
Factors Affecting the Flexural Strength of Steel Fibrous Concrete,
W72-13754 8F

CONDENSATION
Vacuum Distillation Process and Apparatus with Direct Air Contact Condensing for Desalination of Water,
W72-13882 3A

Process and Apparatus for Obtaining Fresh Water from Saline Water,
W72-13892 3A

Distillation Apparatus for Desalinisation of Saline Water to Recover Fresh Water as Condensate,
W72-13897 3A

Water Desalting Process and Apparatus,
W72-13898 3A

Performance Characteristics of Advanced Evaporator Tubes for Long-Tube Vertical Evaporators (An Addendum),
W72-14068 3A

CONFERENCES
Proceedings of the Land Spreading Conference at Orlando, Florida on July 15, 1971.
W72-13704 5D

CONNECTICUT
Dynamics of Flood Frequency,
W72-14003 2E

CONSOLIDATION
Analysis of Uncertainty in Settlement Prediction,
W72-13745 8D

CONSUMPTIVE USE
Estimated Use of Water in the United States in 1970,
W72-13829 6D

CONTAMINATION
Contamination of Lettuce Irrigated with Sewage Effluent,
W72-14104 5B

CONTINENTAL SHELF
Atlantic Continental Shelf and Slope of the United States-Petrology of the Sand Fraction of Sediments, Northern New Jersey to Southern Florida,
W72-13830 2J

The 1973 Conference on the Law of the Sea in the Light of Current Trends in State Seabed Practice,
W72-13941 6E

Brown and Gray Sands on the Virginia Shelf: Color as a Function of Grain Size,
W72-14017 2J

CONTINUOUS BEAMS
Column Load Influence on Reinforced Concrete-Beam Column Connection,
W72-13748 8F

CONTRACTS
Water Resources Research Catalog, Volume Seven.
W72-13617 9C

CONTROL
The Control of Environment.
W72-14122 6G

CONTROL SYSTEM
Control System for Waste Water Treatment Plants,
W72-13895 5D

COOPERATION
Responsibility for Plant Operations,
W72-13742 5F

COORDINATION
Responsibility for Plant Operations,
W72-13742 5F

COPEPODITES
Horizontal and Vertical Distribution of the Interstitial Harpacticoid Copepods of a Sandy Beach,
W72-13783 5C

COPEPODS
The Decline of the Large Zooplankter, Limnocalanus Macrurus Sars (Copepoda: Calanoida), in Lake Erie,
W72-13643 5C

Horizontal and Vertical Distribution of the Interstitial Harpacticoid Copepods of a Sandy Beach,
W72-13783 5C

COPPER
Arazate Method for Estimating Copper in Water,
W72-14191 5A

CORN-M
The Effect of Distance from the Tricklers on Soil Salinity and Growth and Yield of Sweet Corn in an Arid Zone,
W72-14105 3F

CORPORATE POLLUTION
The Law and the Corporate Polluter: Flexibility and Adaption in the Developing Law of the Environment,
W72-13938 5G

COST ANALYSIS
Actual Spray Field Operations,
W72-13710 5D

Potentials for Desalting Water in the Tularosa Basin, New Mexico - A Case Study,
W72-14059 3A

COULOMETER
Versatile Colorimetric Coulometer,
W72-13802 2K

COUNTER-IONS
Influence of Strongly Bound Counter-Ions on Permselective Membranes,
W72-14073 3A

COUNTING
The Quantimet 720P for Routine Biological Assay and Potency Calculation from Colony Count, Inhibition and Exhibition Zone Measurements,
W72-13762 5B

COUPLING PHENOMENA
Water Transport in Hyperfiltration Membranes,
W72-14072 3A

COXSACKIE VIRUS
The Removal of Coxsackie Virus from Water by Sand Obtained from the Rapid Sand Filters of Water-Plants,
W72-14156 5F

CRACKS
Short-Time Deflections of Beams Under Single and Repeated Load Cycles,
W72-13749 8F

CROP PRODUCTION
Skeleton Weed (Chondrilla Juncea) in the Victorian Mallee: V. Chemical Fallowing,
W72-13708 3F

An Analysis of the Rainfall Variations in County Leitrim and Their Influence on Agricultural Production,
W72-13713 3F

Let Your Irrigation System Do All the Work,
W72-13911 3F

Wheeler-Dealing: Jackpot in Hay,
W72-13921 3F

Effects of Environmental Conditions and the Coadministration of Growth Retardants on the Response of Sugarcane to Foliar Treatment with Gibberellin,
W72-13924 3F

CROP RESPONSE
Controlled-Environment Vegetable Production: Results of Trials at Puerto Penasco, Mexico, 1968-1970,
W72-13926 3F

CROPPING PATTERNS
Cropping Pattern in Relation to Well Irrigation,
W72-14150 3F

CROPS
Fertilizer Technology and Use.
W72-14101 3F

CROSS-SECTIONS
Geologic Cross Sections Derived from Seismic Profiles and Sediment Cores from Southern Lake Michigan,
W72-13844 2J

CRUSTACEANS
Mussels and Barnacles as Indicators of the Variation of Manganese-54, Cobalt-60 and Zinc-65 in the Marine Environment,
W72-13978 5B

Comparative Effects of Aquatic Biotoxins on Cardiac Systems,
W72-14056 5C

CULTIVATION
Erosion Control Practices in Primary Cultivation of Soil on Slopes of the Carpathians, (In Russian),
W72-14170 4D

Improvement of Soils By Cultivation in the Non-Chernozem Zone, (In Russian).
W72-14180 3F

CULTURE MEDIA
Loss of Viability by Staphylococcus Aureus in Acidified Media. I., Inactivation by Several Acids, Mixtures of Acids, and Salts of Acids,
W72-13777 5C

CULTURES
Synchronization of Cell Division in Escherichia Coli by Elevated Temperatures: A Reinterpretation,
W72-13666 5C

Hypertrophic Growth,
W72-13668 5C

The Present Status and Future Prospect of the Turbidostat,
W72-13772 5A

CULVERTS
Riprapped Basins for Culvert Outfalls,
W72-13751 8A

CURIE POINT PYROLYSIS GAS CHROMATOGRAPHY
A Technique for Curie Point Pyrolysis Gas Chromatography of Complex Biological Samples,
W72-13761 5A

CURRENT-VOLTAGE CURVES
Study of Membrane-Solution Interfaces by Electro-Chemical Methods,
W72-14075 3A

CUTOFFS
Alluvial Cutoff Dating from Subsequent Growth of a Meander,
W72-14025 2J

CUTTERS
Efficient Excavation,
W72-13746 8H

CYANOPHYTA
The Plankton of Lake Gardno Near the Baltic Sea During the Summer Season,
W72-13637 5C

Nutrient Studies in Texas Impoundments,
W72-13692 5C

DDT: Inhibition of Sodium Chloride Tolerance by the Blue-Green Alga Anacystis Nidulans,
W72-13809 5C

Comparative Effects of Aquatic Biotoxins on Cardiac Systems,
W72-14056 5C

CYCLAMATES
Effect of Cyclamates on the Growth of Pullularia Pullulans,
W72-13814 5C

CYCLAMIC ACID
Effect of Cyclamates on the Growth of Pullularia Pullulans,
W72-13814 5C

CYCLIC LOADS
Microcracking Effect on Flexural Strength of Concrete After Repeated Loading,
W72-13744 8F

Short-Time Deflections of Beams Under Single and Repeated Load Cycles,
W72-13749 8F

CYCLING NUTRIENTS
Water Quality Predictions Based on Limnological Parameters,
W72-13825 5C

CYPRINUS-CARPIO
Interaction Between the Common Carp (Cyprinus Carpio) and the Silver Carp (Hypothalamichthys Molitrix) in Fish Ponds,
W72-14112 8I

CYTOCHROME A
Effect of Temperature on the Respiration and Cytochromes of an Extreme Thermophile,
W72-13765 5C

CYTOLOGICAL STUDIES
Osmotic Stability and Sodium and Potassium Content of L-Forms of Streptococcus Faecalis,
W72-13764 5C

DAM CONSTRUCTION
An Experimental Rock-Sand Dam,
W72-13752 8D

Red River Waterway and Red River Waterway Emergency Bank Protection, Mississippi River to Vicinity of Index, Arkansas, Louisiana, Arkansas, Oklahoma, and Texas (Draft Environmental Impact Statement).
W72-13952 8A

Laneport, North Fork and South Fork Lakes, San Gabriel River, Texas (Draft Environmental Impact Statement).
W72-13956 8A

Authorized China Meadows Dam and Reservoir Lyman Project, Wyoming (Draft Environmental Impact Statement).
W72-13963 8D

Lost Creek Lake Project, Rogue River, Oregon (Draft Environmental Impact Statement).
W72-13965 8D

Stuart Gulch Dam, Idaho (Final Environmental Impact Statement).
W72-13968 8D

DAM DESIGN
An Experimental Rock-Sand Dam,
W72-13752 8D

DAMAGES (LEGAL ASPECTS)
Private Remedies to Abate Water Pollution in Virginia and New Theories in Environmental Law,
W72-13937 5G

DARCY'S LAW
Transformation of the Tensor Form of Darcy's Law in Inhomogeneous and Anisotropic Soils,
W72-14055 2F

DARTERS
Life History of the Eastern Johnny Darter, Etheostoma Olmstedi Storer, in Cold Tailwater and Sewage-Polluted Water,
W72-13998 5C

DATA COLLECTIONS
Virus Inactivation by Water Treatment,
W72-13741 5F

Permafrost in Canada.
W72-13831 7C

A Review of Pesticide Monitoring Programs in California.
W72-14043 7B

West Virginia Water Quality Network.
W72-14048 7B

DAVENPORT (WASH.)
Test-Observation Well Near Davenport, Washington: Description and Preliminary Results,
W72-13733 4B

DDT
The Effect of DDT and Dieldrin Upon C-14 Uptake by in Situ Phytoplankton in Lakes Erie and Ontario,
W72-13657 5C

Thin-Layer Chromatographic-Enzymatic Identification of Some Lindane- and Possible DDT-Metabolites as well as Pentachlorophenol, (Dunnschichtchromatographisch-Enzymatischer Nachweis Einiger Lindan-Und Theoretisch Moglicher DDT-Metaboliten Sowie Von Pentachlorphenol),
W72-13760 5A

DDT: Inhibition of Sodium Chloride Tolerance by the Blue-Green Alga Anacystis Nidulans,
W72-13809 5C

DDT Residues in Eight California Marine Fishes,
W72-13946 5B

DEAERATION
Water Desalting Process and Apparatus,
W72-13898 3A

DECISION MAKING
Symposium: Public Involvement in the Water Management Problems in the Great Lakes,
W72-13665 5C

Responsibility for Plant Operations,
W72-13742 5F

The River Basin Model: The Social Science Laboratory.
W72-13929 6A

The River Basin Model: Chairman and Council.
W72-13930 6A

Authorization of Federal Water Projects (Final Report, Draft Review),
W72-13957 6B

DECOMPOSITION
Studies on the Course of Litter Decomposition in a Hungarian Quercetum-Petraeae-Cerris Forest Stand,
W72-14165 4A

DECONTAMINATION (WATER)
Adsorption-Desorption Equilibria of Some Radionuclides in Sediment-Freshwater and Sediment-Seawater Systems,
W72-13974 5B

DEFICIENT ELEMENTS
Hypertrophic Growth,
W72-13668 5C

DEFLECTION
Short-Time Deflections of Beams Under Single and Repeated Load Cycles,
W72-13749 8F

DEGRADATION
The Effect of Light and Humidity on Absorption and Degradation of Diphenamid in Tomatoes,
W72-14125 3F

DEGRADATION (DECOMPOSITION)
Effect of Mineral Particulates on Microbial Degradation of Solid Organic Materials,
W72-13645 5C

Cellulolytic Activity in Municipal Solid Waste Composting,
W72-13686 5B

Oil Pollution: Persistence and Degradation of Spilled Fuel Oil,
W72-13810 5B

DELAWARE
Surface Water Supply of the United States, 1961-65, Part 1. North Atlantic Slope Basins--Volume 2. Basins from New York to Delaware.
W72-13827 7C

General Ground-Water Quality in Fresh-Water Aquifers of Delaware,
W72-13832 5B

Geology and Ground Water, University of Delaware, Newark, Delaware,
W72-13833 4B

Nitrate Contamination of the Water-Table Aquifer in Delaware,
W72-13834 5B

Ground-Water Geology of the Delaware Atlantic Seashore,
W72-13835 2F

DELAWARE RIVER
Model Studies of Outfall Systems for Desalination Plants (Part II - Estuary Models),
W72-14064 5B

DELTAS
Permeability Distribution in a Holocene Distributary Channel-Fill Near Leerdam (The Netherlands),
W72-13730 2J

Chronology of a Kettle-Hole Peat Bog, Cherryfield, Maine,
W72-14019 2J

River Discharge into an Ice-Covered Ocean and Related Sediment Dispersal, Beaufort Sea, Coast of Alaska,
W72-14020 2J

DEMINERALIZATION
Reverse Osmosis System,
W72-13879 3A

Adsorption-Desorption Equilibria of Some Radionuclides in Sediment-Freshwater and Sediment-Seawater Systems,
W72-13974 5B

Transport Property Requirements of Membranes for Use in Pressure Dialysis Desalination,
W72-14088 3A

DENITRIFICATION
Swine Waste Characterization and Evaluation of Animal Waste Treatment Alternatives,
W72-13635 5D

Biological Denitrification Using Fluidized Granular Beds,
W72-14047 5D

DEPTH
Oxygen Uptake and Mechanism of Substrate Purification in a Model Trickling Filter,
W72-13697 5D

DES MOINES RIVER (IOWA)
Alluvial Cutoff Dating from Subsequent Growth of a Meander,
W72-14025 2J

DESALINATION
Reverse Osmosis System,
W72-13879 3A

Vacuum Distillation Process and Apparatus with Direct Air Contact Condensing for Desalination of Water,
W72-13882 3A

Ion Exchange Apparatus for Treating Liquids,
W72-13885 3A

Desalination Apparatus and Process of Manufacture Using Improved, Acid Grafted Nitrogenous Membranes,
W72-13886 3A

Process and Apparatus for Obtaining Fresh Water from Saline Water,
W72-13892 3A

Distillation Apparatus for Desalinisation of Saline Water to Recover Fresh Water as Condensate,
W72-13897 3A

Water Desalting Process and Apparatus,
W72-13898 3A

Review of California's Regional Water Supply Systems and Possible Applications of Desalting,
W72-13917 3B

V.T.E. Desalting Plant, St. Croix, U.S. Virgin Islands Analysis of Operational Data,
W72-14058 3A

A Turbulent Flow Theory of Electrodialysis,
W72-14061 3A

Direct Contact Desulfation Laboratory and Pilot Plant Development Study for Softening of Sea Water,
W72-14065 3A

Optimization of Dissolved Oxygen Measurements,
W72-14066 5A

Reverse Osmosis Membrane Module (Spiral-Wound Concept),
W72-14069 3A

Freezing Process Studies,
W72-14070 3A

Water Transport in Hyperfiltration Membranes,
W72-14072 3A

Operation of Reverse Osmosis Pilot Plants,
W72-14074 3A

Study of Membrane-Solution Interfaces by Electro-Chemical Methods,
W72-14075 3A

Drying Cellulose Acetate Reverse Osmosis Membranes,
W72-14078 3A

Control of Concentration Polarization in Reverse Osmosis Desalination of Water,
W72-14080 3A

Application of Inorganic Ion Exchange MEMBRANES TO Electrodialysis,
W72-14081 3A

Hydraulic Design Optimization of the Electrodialysis Process,
W72-14082 3A

Transport Processes in Hyperfiltration Membranes I,
W72-14083 3A

Research on Ion Transport Across Microbial Membranes,
W72-14084 3A

Continuing Development of a General Mechanistic Theory of Membrane Phenomena and Continuing Experimental and Theoretical Studies of Ion-Exchange Polarization Phenomena,
W72-14085 3A

A Study of the Disposal of the Effluent from a Large Desalination Plant,
W72-14086 5B

Reverse Osmosis Membrane Module (Spiral Wound Concept),
W72-14087 3A

Transport Property Requirements of Membranes for Use in Pressure Dialysis Desalination,
W72-14088 3A

DESALINATION APPARATUS
A Turbulent Flow Theory of Electrodialysis,
W72-14061 3A

DESALINATION PROCESSES
Proposed Hybrid Prototype Desalting Plant for Brownsville, Texas (Draft Environmental Impact Statement).
W72-13958 3A

Potentials for Desalting Water in the Tularosa Basin, New Mexico - A Case Study,
W72-14059 3A

Influence of Strongly Bound Counter-Ions on Permselective Membranes,
W72-14073 3A

DESERT LOCUST
Effect of Soil Moisture on the Phase Characters of Hatchlings in the Desert Locust, Schistocerca Gregaria Forsk,
W72-14092 2I

DESIGN
Hydraulic Design Optimization of the Electrodialysis Process,
W72-14082 3A

DESIGN CRITERIA
Engineering Design Criteria for Spray Irrigation,
W72-13709 5D

DESORPTION
Sorption-Desorption Reactions of Mercury with Suspended Matter in the Columbia River,
W72-13972 5B

Adsorption-Desorption Equilibria of Some Radionuclides in Sediment-Freshwater and Sediment-Seawater Systems,
W72-13974 5B

DESULFATION
Direct Contact Desulfation Laboratory and Pilot Plant Development Study for Softening of Sea Water,
W72-14065 3A

DETECTION
New Methods for Detection and Quantification in ThindLayer Chromatography: A Study of Pyrolysis and Combustion Systems,
W72-13768 5A

Precision of Electrical Detection Measurements of Powdered Samples in Spark Source Mass Spectrometry,
W72-13787 5A

DETERGENTS
A Survey of Housewives' Attitudes,
W72-13664 5C

Phosphorus in Wastewater,
W72-14046 5B

DETERIORATION
A Framework for Identification and Control of Resource Degradation and Conflict in the Multiple Use of the Coastal Zone,
W72-13906 5G

DETOX
The Effect of Certain Chlorinated Organic Pesticides on Hygienic Indicators of Water,
W72-14164 5C

DIALYSIS
Transport Property Requirements of Membranes for Use in Pressure Dialysis Desalination,
W72-14088 3A

DIATOMS
Evidence for the Eutrophication of Lake Ontario from the Sedimentary Diatom Succession,
W72-13641 5C

DIELDRIN
The Effect of DDT and Dieldrin Upon C-14 Uptake by in Situ Phytoplankton in Lakes Erie and Ontario,
W72-13657 5C

Chlorinated Hydrocarbon, Microparticulate Effects on Microorganisms Isolated from Lake Erie,
W72-13999 5C

DIETHYLSTILBESTROL
Determination of Diethylstilbestrol in Cattle Tissues,
W72-13677 5A

DIFFERENTIAL LIGHT SCATTERING
Size Distribution of Bacterial Cells,
W72-13667 5A

DIFFERENTIAL PRESSURE STICKING
Techniques for Preventing Differential-Pressure Sticking of Drill Pipe,
W72-13618 8C

New Pipe Configuration Reduces Wall Sticking,
W72-13633 8A

DIFFUSERS
Model Studies of Outfall Systems for Desalination Plants (Part II - Estuary Models),
W72-14064 5B

DIFFUSIVITY
Effect of Eddy Diffusivity on Wind-Driven Currents in a Two-layer Stratified Lake,
W72-14010 2H

DIKES
Diked Disposal Area Program, Duluth-Superior Harbor, St. Louis County, Minnesota and Douglas County, Wisconsin (Draft Environmental Impact Statement).
W72-13954 5G

DIMERS
An Experimental Study of the Structure, Thermodynamics and Kinetic Behavior of Water,
W72-14060 1B

DIPHENAMID
The Effect of Light and Humidity on Absorption and Degradation of Diphenamid in Tomatoes,
W72-14125 3F

DIRECT BENEFITS
Economic Efficiency in the Allocation of Irrigation Water Over Time,
W72-13823 6B

DIRECT CONTACT DESULFATION
Direct Contact Desulfation Laboratory and Pilot Plant Development Study for Softening of Sea Water,
W72-14065 3A

DISCHARGE
Permissible Activity Discharge into Receiving Waters Through Radioactive Waste Water from Nuclear Power Plants (Zulassige Aktivitatseinleitung in Vorfluter durch radioaktive Abwasser aus Kernkraftwerken),
W72-13987 5A

DISCHARGE (WATER)
Ground-Water Outflow from Chino Basin, Upper Santa Ana Valley, Southern California,
W72-13838 2F

DISEASES
Virus and Water Quality: Occurrence and Control.
W72-13610 5F

DISINFECTION
Virus and Water Quality: Occurrence and Control.
W72-13610 5F

Evaluation of the Hypoiodous Iodine Tablet - Phase II,
W72-13701 5F

DISPERSION
Marin Environmental Quality, Suggested Research Programs for Understanding Man's Effect on the Oceans.
W72-13903 5A

Model Studies of Outfall Systems for Desalination Plants (Part II - Estuary Models),
W72-14064 5B

DISSOLVED OXYGEN
Hypothesis for Dissolved Oxygen Depletion in the Central Basin Hypolimnion of Lake Erie,
W72-13659 5C

A Probabilistic Analysis of Dissolved Oxygen-Biochemical Oxygen Demand Relationship in Streams,
W72-13688 5B

Oxygen Uptake and Mechanism of Substrate Purification in a Model Trickling Filter,
W72-13697 5D

Measurements of Very Low Oxygen Tensions in Unstirred Liquids,
W72-13785 5A

Sewage Treatment Apparatus and Method,
W72-13893 5D

Method and Apparatus for Use in the Activated Sludge Treatment of Sewage,
W72-13901 5D

Optimization of Dissolved Oxygen Measurements,
W72-14066 5A

DISSOLVED OXYGEN DEFICIT
A Probabilistic Analysis of Dissolved Oxygen-Biochemical Oxygen Demand Relationship in Streams,
W72-13688 5B

DISTILLATION
Vacuum Distillation Process and Apparatus with Direct Air Contact Condensing for Desalination of Water,
W72-13882 3A

Distillation Apparatus for Desalinisation of Saline Water to Recover Fresh Water as Condensate,
W72-13897 3A

V.T.E. Desalting Plant, St. Croix, U.S. Virgin Islands Analysis of Operational Data,
W72-14058 3A

Optimization of Dissolved Oxygen Measurements,
W72-14066 5A

DISTILLATION PROCESSES
Performance Characteristics of Advanced Evaporator Tubes for Long-Tube Vertical Evaporators (An Addendum),
W72-14068 3A

DISTRIBUTION
The Decline of the Large Zooplankter, Limnocalanus Macrurus Sars (Copepoda: Calanoida), in Lake Erie,
W72-13643 5C

Size Distribution of Bacterial Cells,
W72-13667 5A

Data on the Ecology and Geographical Distribution of the Testaceans of the Area of the Future Dam Lake at Iron Gate,
W72-13755 2I

Studies on the Behaviours and Distribution of Radioactive Substances in Coastal and Estuarine Waters,
W72-13976 5B

DISTRIBUTION PATTERNS
The Annual Cycle in Quantity and Composition of the Zooplankton of the Sargasso Sea Off Bermuda. II. The Surface to 2,000 m,
W72-13775 5B

Distribution Patterns for Some Particulate and Dissolved Trace Metals Within an Active Glacial Fjord,
W72-13973 5B

DOLOMITE
Carbonate Chemistry of Aquifer and Stream Water in Kentucky,
W72-14004 2F

DOMESTIC WASTES
Chemical Treating Process for Sewage Systems,
W72-13899 5D

DOUGLAS FIR
Psychrometric Apparatus for Bowen-Ratio Determination Over Forests,
W72-14184 7B

DOUGLAS-FIR-G
Moisture Stress and Stem Diameter in Young Douglas-Fir,
W72-14098 2I

Studies of Moisture Status and Storage Conditions of Spring-Lifted, Mud-Packed Douglas-Fir Seedlings,
W72-14100 2I

DRAINAGE PATTERNS (GEOLOGIC)
Buried Channel Aquifers and Present Open Drainage System of East Gelderland, The Netherlands,
W72-13722 2F

DREDGING
Sandusky Harbor, Erie County, Ohio (Draft Environmental Impact Statement).
W72-13950 5G

Fairport Harbor, Lake County, Ohio (Draft Environmental Impact Statement).
W72-13961 4A

DRILL BITS
Why Rock-Bit Bearings Fail,
W72-13632 8G

DRILLING
Analytical Determination of Optimum Bit Weight and Rotary Speed Combinations,
W72-13619 8C

Two-Dimensional Study of Rock Breakage in Drag-Bit Drilling at Atmospheric Pressure,
W72-13625 8C

DRILLING FLUIDS
Techniques for Preventing Differential-Pressure Sticking of Drill Pipe,
W72-13618 8C

Plan the Mud Program to Reduce Exploration Cost,
W72-13620 8A

Which Lost-Circulation Materials to Use ... And How to Use Them,
W72-13621 8G

Squeeze Slurries for Lost Circulation Control,
W72-13622 8G

A New Look at Lost Circulation,
W72-13623 8G

Chemical Removal of Drilled Solids,
W72-13624 8G

An Analysis and the Control of Lost Circulation,
W72-13627 8B

Use of Chemicals to Maintain Clear Water for Drilling,
W72-13628 8C

Ability of Drilling Mud to Lift Bit Cuttings,
W72-13629 8B

Pressure-Differential Sticking of Drill Pipe and How it Can be Avoided or Relieved,
W72-13630 8C

DRIVING RAIN
Estimating the Wetting of Walls by Driving Rain (Ob otsenke uvlazheniya sten pri kosykh dozhydakh),
W72-13855 7B

DROPWISE CONDENSATION
Performance Characteristics of Advanced Evaporator Tubes for Long-Tube Vertical Evaporators (An Addendum),
W72-14068 3A

DROUGHT
Drought Resistance in Subalpine Nymphs of Somatochlora Semicircularis Solys (Odonata: Corduliidae),
W72-14183 2I

DRUM FISH
Evaluation of Intensive Freshwater Drum (Aplodinotus Grunniens) Removal in Lake Winnebago, Wisconsin, 1955-1966,
W72-14109 2H

DUCKS (WILD)
Pesticide and Mercury Levels in Migrating Duck Populations,
W72-13865 5C

DULUTH-SUPERIOR HARBOR
Diked Disposal Area Program, Duluth-Superior Harbor, St. Louis County, Minnesota and Douglas County, Wisconsin (Draft Environmental Impact Statement).
W72-13954 5G

DURHAM
Effects of Land Use on Municipal Watersheds,
W72-13759 4C

DUTCH WADDEN ISLANDS
Additions to the List of Odonata of the Dutch Wadden Islands, with an Account of Water Quality Data of Larval Habitats, and a Review of the Dragonfly Fauna of the Dutch and German Northsea Islands,
W72-14162 2I

DYES
Radiation Treatment of Materials,
W72-13883 5D

E. COLI
Synchronization of Cell Division in Escherichia Coli by Elevated Temperatures: A Reinterpretation,
W72-13666 5C

Contamination of Lettuce Irrigated with Sewage Effluent,
W72-14104 5B

EARTHQUAKES
Growth of a Talus Cone in the Western Chugach Mountains, Alaska,
W72-14026 2J

EAST GELDERLAND (THE NETHERLANDS)
Buried Channel Aquifers and Present Open Drainage System of East Gelderland, The Netherlands,
W72-13722 2F

EASTERN JOHNNY DARTER
Life History of the Eastern Johnny Darter, Etheostoma Olmstedi Storer, in Cold Tailwater and Sewage-Polluted Water,
W72-13998 5C

ECOLOGICAL DISTRIBUTION
Horizontal and Vertical Distribution of the Interstitial Harpacticoid Copepods of a Sandy Beach,
W72-13783 5C

Salinity Tolerances of Some Common Prosobranchs,
W72-13795 5C

ECOLOGY
Life History and Ecology of the Gizzard Shad, Dorosoma Cepedianum (Le Sueur) With Reference to Elephant Butte Lake,
W72-13927 2H

Design and Siting Criteria for Once-Through Cooling Systems Based on a First-Order Thermal Plume Model,
W72-14030 5C

Oil and the Ecology of the Arctic,
W72-14188 5C

ECONOMIC EFFICIENCY
Economic Efficiency in the Allocation of Irrigation Water Over Time,
W72-13823 6B

ECONOMIC PREDICTION
The Allocation of Regional Water Supplies. A Case Study of the Northeastern United States,
W72-13698 6B

ECONOMICS
Thermal Aquaculture: Engineering and Economics,
W72-13743 6B

EDDIES
Effect of Eddy Diffusivity on Wind-Driven Currents in a Two-layer Stratified Lake,
W72-14010 2H

EDUCATION
The River Basin Model: The Social Science Laboratory.
W72-13929 6A

EFFECTS
Effect of Land use Period on Soil Properties,
W72-13922 2G

EFFICIENCIES
Efficient Excavation,
W72-13746 8H

EFFLUENT LAND SPREADING
Proceedings of the Land Spreading Conference at Orlando, Florida on July 15, 1971.
W72-13704 5D

EFFLUENT LANDSPREADING
Some Aspects of Effluent Landspreading,
W72-13712 5D

EFFLUENTS
Characterization of Gas Chromatographic Effluents Via Scanning Fluorescence Spectrometry,
W72-13672 5A

On The Physico-Chemical Behavior of Radioactive Cerium in Sea Water,
W72-13970 5B

Transport and Depletion of Radionuclides in the Columbia River,
W72-13975 5B

Mussels and Barnacles as Indicators of the Variation of Manganese-54, Cobalt-60 and Zinc-65 in the Marine Environment,
W72-13978 5B

Concentrations of Zinc-65 in Marine Foodstuffs and Pacific Coastal Residents,
W72-13979 5B

Environmental Radioactivity at the National Nuclear Research Centre, Pelendaba. Report for the year 1970.
W72-13984 5B

Permissible Activity Discharge into Receiving Waters Through Radioactive Waste Water from Nuclear Power Plants (Zulassige Aktivitatseinleitung in Vorfluter durch radioaktive Abwasser aus Kernkraftwerken),
W72-13987 5A

EGGS
Eggs of Floodwater Mosquitoes: XIV. Northern Aedes (Diptera: Culicidae),
W72-14115 2I

EL PASO (TEX)
Development of Ground Water in the El Paso District, Texas, 1963-70,
W72-14029 2F

ELASTOMERS
Method for Preventing Water Loss from Reservoirs and Channels,
W72-13889 4A

ELECTRIC POWER DEMAND
Thermal Effluents from Electrical Power Generation,
W72-13905 5C

ELECTRIC POWER PRODUCTION
Salt River Project 1971 Annual Report.
W72-13913 4A

ELECTRICAL PROPERTIES
Electricity of Clouds,
W72-14039 2B

ELECTRICITY
Electricity of Clouds,
W72-14039 2B

ELECTROCHEMISTRY
Study of Membrane-Solution Interfaces by Electro-Chemical Methods,
W72-14075 3A

ELECTRODES
Semiintegral Electroanalysis: Theory and Verification,
W72-13791 2K

ELECTRODIALYSIS
Electrodialysis: A Method for Extracting Available Nutrients in Great Lakes Sediments,
W72-13658 5C

A Turbulent Flow Theory of Electrodialysis,
W72-14061 3A

Influence of Strongly Bound Counter-Ions on Permselective Membranes,
W72-14073 3A

Study of Membrane-Solution Interfaces by Electro-Chemical Methods,
W72-14075 3A

Application of Inorganic Ion Exchange MEMBRANES TO Electrodialysis,
W72-14081 3A

Hydraulic Design Optimization of the Electrodialysis Process,
W72-14082 3A

Continuing Development of a General Mechanistic Theory of Membrane Phenomena and Continuing Experimental and Theoretical Studies of Ion-Exchange Polarization Phenomena,
W72-14085 3A

ELECTRODIALYSIS SPACERS
Hydraulic Design Optimization of the Electrodialysis Process,
W72-14082 3A

ELECTRON CAPTURE GAS CHROMATOGRAPHY
Studies on the Determination of Physiological Levels of Chromium in Serum by Gas Chromatography,
W72-13767 5A

Identification of Organochlorine Pesticide Residues by Ultraviolet Solid-Phase Photolysis,
W72-13786 5A

ELECTRON SCANNING MICROSCOPE
Eggs of Floodwater Mosquitoes: XIV. Northern Aedes (Diptera: Culicidae),
W72-14115 2I

ELECTRONIC EQUIPMENT
Equipping Structures of Hydroelectric Power Stations with Measuring Devices for Monitoring Percolation,
W72-13758 8D

ELECTROPHORESIS
The Removal of Radionuclides From Water by Hydrous Ferric Oxide,
W72-13699 5D

ELECTROREDUCTION
Semiintegral Electroanalysis: Theory and Verification,
W72-13791 2K

ELEMENTAL ANALYZER
Microdetermination of Carbon, Hydrogen, Nitrogen and Oxygen in Petroleum Compounds with an Automatic Elemental Analyzer,
W72-13805 5A

ELEPHANT BUTTE LAKE
Life History and Ecology of the Gizzard Shad, Dorosoma Cepedianum (Le Sueur) With Reference to Elephant Butte Lake,
W72-13927 2H

EMBANKMENT DAMS
Lost Creek Lake Project, Rogue River, Oregon (Draft Environmental Impact Statement).
W72-13965 8D

EMISSION SPECTROMETRY
Emission Spectrometric Determination of Trace Amounts of Mercury,
W72-13790 5A

EMULSIFIERS
Chemical Treating Process for Sewage Systems,
W72-13899 5D

ENDOMYCOPSIS LIPOLYTICA
Growth of Endomycopsis Lipolytica on Hydrocarbons,
W72-13817 5A

ENDOSULFAN
The Persistence of Endosulfan in Surface Water,
W72-14193 5B

ENDRIN
Chlorinated Hydrocarbon, Microparticulate Effects on Microorganisms Isolated from Lake Erie,
W72-13999 5C

ENERGY DISSIPATION
Roughness Elements as Energy Dissipators of Free-Surface Flow in Circular Pipes,
W72-13747 8B

ENERGY DISSIPATORS
Roughness Elements as Energy Dissipators of Free-Surface Flow in Circular Pipes,
W72-13747 8B

ENTERIC BACTERIA
Virus and Water Quality: Occurrence and Control.
W72-13610 5F

ENVIRONMENT
The Control of Environment.
W72-14122 6G

Man and His Environment: Climate,
W72-14137 6G

ENVIRONMENTAL AFFECTS
Fish and Wildlife in the Marine and Coastal Zone, Part A, Summary Planning Information, and Recommendations,
W72-13908 6G

ENVIRONMENTAL EFFECTS
Notes on the Avifauna of the Marshy Area of Pierrepont-Sissonne (Laonnois-Aisne) II,
W72-13678 5C

Seasonal Variations in the Avifauna Composition of the Lavours Swamp (AIN),
W72-13799 2I

Oil Pollution: Persistence and Degradation of Spilled Fuel Oil,
W72-13810 5B

Marin Environmental Quality, Suggested Research Programs for Understanding Man's Effect on the Oceans.
W72-13903 5A

Study of Environmental Impacts of Alternative Long Island Sound Bridge Sites,
W72-13907 6G

Controlled-Environment Vegetable Production: Results of Trials at Puerto Penasco, Mexico, 1968-1970,
W72-13926 3F

Sandusky Harbor, Erie County, Ohio (Draft Environmental Impact Statement).
W72-13950 5G

Winnebago-Bean Creek Watershed, Richardson County, Nebraska (Draft Environmental Impact Statement).
W72-13951 4D

Rural Environmental Assistance Program (Draft Environmental Impact Statement).
W72-13953 5G

Diked Disposal Area Program, Duluth-Superior Harbor, St. Louis County, Minnesota and Douglas County, Wisconsin (Draft Environmental Impact Statement).
W72-13954 5G

ENVIRONMENTAL EFFECTS

Dively Drainage and Levee District (District 23), Illinois (Draft Environmental Impact Statement).
W72-13955 8D

Laneport, North Fork and South Fork Lakes, San Gabriel River, Texas (Draft Environmental Impact Statement).
W72-13956 8A

Proposed Hybrid Prototype Desalting Plant for Brownsville, Texas (Draft Environmental Impact Statement).
W72-13958 3A

Water Bank Program (Draft Environmental Impact Statement).
W72-13959 6G

Kingstree Branch Flood Control Project, South Carolina (Draft Environmental Impact Statement).
W72-13960 4A

Fairport Harbor, Lake County, Ohio (Draft Environmental Impact Statement).
W72-13961 4A

Lorain Harbor, Ohio (Maintenance) (Draft Environmental Impact Statement).
W72-13962 4A

Authorized China Meadows Dam and Reservoir Lyman Project, Wyoming (Draft Environmental Impact Statement).
W72-13963 8D

Little River Inlet, North Carolina and South Carolina, Navigation Improvements (Draft Environmental Impact Statement).
W72-13964 4A

Lost Creek Lake Project, Rogue River, Oregon (Draft Environmental Impact Statement).
W72-13965 8D

Winnebago-Bean Creek Watershed, Nebraska (Final Environmental Impact Statement).
W72-13966 4D

Program Statement for the Proposed Prototype Oil Shale Leasing Program (Draft Environmental Impact Statement).
W72-13969 3E

Design and Siting Criteria for Once-Through Cooling Systems Based on a First-Order Thermal Plume Model,
W72-14030 5C

ENVIRONMENTAL IMPACT STATEMENT

Award of P.L. 660 Grant for Construction of Wastewater Treatment Facilities and Outfall Sewers--Project No. WPC-TEX-722 (Draft Environmental Impact Statement).
W72-13949 5D

Sandusky Harbor, Erie County, Ohio (Draft Environmental Impact Statement).
W72-13950 5G

Winnebago-Bean Creek Watershed, Richardson County, Nebraska (Draft Environmental Impact Statement).
W72-13951 4D

Red River Waterway and Red River Waterway Emergency Bank Protection, Mississippi River to Vicinity of Index, Arkansas, Louisiana, Arkansas, Oklahoma, and Texas (Draft Environmental Impact Statement).
W72-13952 8A

Rural Environmental Assistance Program (Draft Environmental Impact Statement).
W72-13953 5G

Diked Disposal Area Program, Duluth-Superior Harbor, St. Louis County, Minnesota and Douglas County, Wisconsin (Draft Environmental Impact Statement).
W72-13954 5G

Dively Drainage and Levee District (District 23), Illinois (Draft Environmental Impact Statement).
W72-13955 8D

Laneport, North Fork and South Fork Lakes, San Gabriel River, Texas (Draft Environmental Impact Statement).
W72-13956 8A

Proposed Hybrid Prototype Desalting Plant for Brownsville, Texas (Draft Environmental Impact Statement).
W72-13958 3A

Water Bank Program (Draft Environmental Impact Statement).
W72-13959 6G

Kingstree Branch Flood Control Project, South Carolina (Draft Environmental Impact Statement).
W72-13960 4A

Fairport Harbor, Lake County, Ohio (Draft Environmental Impact Statement).
W72-13961 4A

Lorain Harbor, Ohio (Maintenance) (Draft Environmental Impact Statement).
W72-13962 4A

Authorized China Meadows Dam and Reservoir Lyman Project, Wyoming (Draft Environmental Impact Statement).
W72-13963 8D

Little River Inlet, North Carolina and South Carolina, Navigation Improvements (Draft Environmental Impact Statement).
W72-13964 4A

Lost Creek Lake Project, Rogue River, Oregon (Draft Environmental Impact Statement).
W72-13965 8D

Winnebago-Bean Creek Watershed, Nebraska (Final Environmental Impact Statement).
W72-13966 4D

Aquatic Plant Control Program, Hudson and Mohawk Rivers, New York (Final Environmental Impact Statement).
W72-13967 4A

Stuart Gulch Dam, Idaho (Final Environmental Impact Statement).
W72-13968 8D

Program Statement for the Proposed Prototype Oil Shale Leasing Program (Draft Environmental Impact Statement).
W72-13969 3E

ENVIRONMENTAL MODEL

A Study of the Disposal of the Effluent from a Large Desalination Plant,
W72-14086 5B

ENVIRONMENTAL PROTECTION AGENCY

Potable Waters.
W72-13940 5G

ENZYMATIC INHIBITORS

Thin-Layer Chromatographic-Enzymatic Identification of Some Lindane- and Possible DDT-Metabolites as well as Pentachlorophenol, (Dunnschichtchromatographisch-Enzymatischer Nachweis Einiger Lindan-Und Theoretisch Moglicher DDT-Metaboliten Sowie Von Pentachlorphenol),
W72-13760 5A

EPHEMERAL STREAMS

Longitudinal Profiles of Ephemeral Streams in Southeastern Arizona,
W72-14021 2E

EPIDEMICS

Enteric Viruses in Ground and Surface Waters: A Review of their Occurrence and Survival,
W72-13611 5F

EQUILIBRIUM

U234/U238 Disequilibrium in Groundwaters of Central Texas,
W72-13971 5B

Anomalous Th228/Th232 and Th230/232 Activity Ratios in Backwater Sediments Along the West Coast of India.
W72-13982 5B

EQUIPMENT

A New Light Trap for Plankton,
W72-13797 5A

EROSION

Riprapped Basins for Culvert Outfalls,
W72-13751 8A

Nonantecedent Development of Truckee River Canyon, Northern Carson Range, Nevada and California,
W72-14015 2J

EROSION CONTROL

Riprapped Basins for Culvert Outfalls,
W72-13751 8A

Erosion Control Practices in Primary Cultivation of Soil on Slopes of the Carpathians, (In Russian),
W72-14170 4D

Erosion-Ameliorative Investigations of Soils in Kazakhstan, (In Russian),
W72-14174 4D

ESTIMATED COSTS

An Example of Economic Plating Waste Treatment by Reverse Osmosis,
W72-13687 5D

ESTIMATING

Evaluation of a Deterministic Model for Predicting Water Yields from Small Agricultural Watersheds in Virginia,
W72-13824 2A

Estimated Use of Water in the United States in 1970,
W72-13829 6D

Recreation Benefit Estimation and Forecasting: Implications of the Identification Problem,
W72-13934 6A

ESTUARIES

Hydrology of Alabama Areas--Cooperative Gulf of Mexico Estuarine Inventory,
W72-13840 5B

ESTURARIES
Esturine Ecosystems and High Temperatures,
W72-13636 5C

EUROPEAN USSR
Channel Network of a Basin and Formation of Runoff (Ruslovaya set' basseyna i protsess formirovaniya stoka vody),
W72-13853 2E

Hydrologic Investigations, Computations, and Forecasts (Voprosy gidrologicheskikh issledovaniy, raschetov i prognozov).
W72-13854 4A

Estimating the Wetting of Walls by Driving Rain (Ob otsenke uvlazheniya sten pri kosykh dozhydakh),
W72-13855 7B

Formation, Calculation, and Regulation of Streamflow (Formirovaniye, raschety i regulirovaniye rechnogo stoka).
W72-13857 4A

EUSTROPHICATION
Limnology of Oneida Lake with Emphasis on Factors Contributing to Algal Blooms,
W72-13851 5C

EUTROPHICATION
The Plankton of Lake Gardno Near the Baltic Sea During the Summer Season,
W72-13637 5C

Proceedings, Fourteenth Conference on Great Lakes Research.
W72-13640 5C

Evidence for the Eutrophication of Lake Ontario from the Sedimentary Diatom Succession,
W72-13641 5C

A Case of Nutrient Enrichment in an Inshore Area of Georgian Bay,
W72-13662 5C

Comprehensive Abatement Program for an Eutrophic Lake,
W72-13663 5C

A Quantitative Comparison of Pigment Extraction by Membrane and Glass-Fiber Filters,
W72-13673 5A

Water Quality Predictions Based on Limnological Parameters,
W72-13825 5C

Dynamics of Phytoplankton Primary Production and Biomass in Loviisa Archipelago (Gulf of Finland),
W72-13871 5C

A Study of Phosphate Induced Algal Growth in Order to Suppress or Eliminate this Phenomenon,
W72-13992 5A

Patterns of Lakeshore Usage Around Lake Bemidji,
W72-14131 5C

The Hydrological Conditions of Ambaro Bay (Northwestern Madagascar): Contribution to the Study of a Tropical Eutrophic Bay, (In French),
W72-14182 5C

EUTROPLICATION
Hypertrophic Growth,
W72-13668 5C

EVALUATION
Evaluation of Methods for Detection of Coliform Bacteria in Raw Milk,
W72-13671 5A

A Quantitative Comparison of Pigment Extraction by Membrane and Glass-Fiber Filters,
W72-13673 5A

EVAPORATION
Acceleration Units,
W72-13880 5D

Process and Apparatus for Obtaining Fresh Water from Saline Water,
W72-13892 3A

Distillation Apparatus for Desalinisation of Saline Water to Recover Fresh Water as Condensate,
W72-13897 3A

Water Desalting Process and Apparatus,
W72-13898 3A

Exploratory Study of Brine Disposal Using Fluid-Bed Evaporation,
W72-14063 5E

Performance Characteristics of Advanced Evaporator Tubes for Long-Tube Vertical Evaporators (An Addendum),
W72-14068 3A

Disposal of Brine by Solar Evaporation,
W72-14077 2D

An Instrument for Continuous Recording of Natural Evaporation,
W72-14136 7B

EVAPORATION RATES
Disposal of Brine by Solar Evaporation,
W72-14077 2D

EVAPORATOR
V.T.E. Desalting Plant, St. Croix, U.S. Virgin Islands Analysis of Operational Data,
W72-14058 3A

EVAPOTRANSPIRATION
Simultaneous Determination of Short-Period Photosynthesis and Evapotranspiration,
W72-14009 3F

Participation of Moisture Rising from Ground Water in Covering Water Deficiencies Between Evapotranspiration and Precipitations, (In Polish),
W72-14177 2G

EVOLUTION
Competition and Its Bearing on the Freshwater Faunas,
W72-14176 2I

EXCHANGE REACTIONS
Spectrophotometric Determination of Trace Quantities of Iron (III) by an Exchange Reaction with Metal Acetylacetonates,
W72-13793 5A

EXPERIMENTAL FARMS
Simultaneous Determination of Short-Period Photosynthesis and Evapotranspiration,
W72-14009 3F

EXPLOITATION
The 1973 Conference on the Law of the Sea in the Light of Current Trends in State Seabed Practice,
W72-13941 6E

EXPLORATION
Plan the Mud Program to Reduce Exploration Cost,
W72-13620 8A

EXPLORATORY DRILLING
Plan the Mud Program to Reduce Exploration Cost,
W72-13620 8A

EXTRACTION
The Analysis of Trace Organics in Fresh Water by Gas Chromatography -- Mass Spectroscopy,
W72-14057 5A

FAIRPORT HARBOR (OHIO)
Fairport Harbor, Lake County, Ohio (Draft Environmental Impact Statement).
W72-13961 4A

FALLOUT
On The Physico-Chemical Behavior of Radioactive Cerium in Sea Water,
W72-13970 5B

Mussels and Barnacles as Indicators of the Variation of Manganese-54, Cobalt-60 and Zinc-65 in the Marine Environment,
W72-13978 5B

FALLOWING
Skeleton Weed (Chondrilla Juncea) in the Victorian Mallee: V. Chemical Fallowing,
W72-13708 3F

FARM LAGOONS
Swine Waste Characterization and Evaluation of Animal Waste Treatment Alternatives,
W72-13635 5D

FARM WASTES
Swine Waste Characterization and Evaluation of Animal Waste Treatment Alternatives,
W72-13635 5D

FATHEAD MINNOWS
Growth of the Fathead Minnow (Pimephales Promelas) in Tertiary Treatment Ponds,
W72-13868 5C

FATIGUE (MATERIALS)
Microcracking Effect on Flexural Strength of Concrete After Repeated Loading,
W72-13744 8F

FAUNA
Competition and Its Bearing on the Freshwater Faunas,
W72-14176 2I

FAYETTE COUNTY (ILL)
Dively Drainage and Levee District (District 23), Illinois (Draft Environmental Impact Statement).
W72-13955 8D

FEDERAL GOVERNMENT
Authorization of Federal Water Projects (Final Report, Draft Review),
W72-13957 6B

FEDERAL JURISDICTION
Water Bank Program (Draft Environmental Impact Statement).
W72-13959 6G

FEDERAL WATER PROJECTS POLICY
Authorization of Federal Water Projects (Final Report, Draft Review),
W72-13957 6B

FEEDING HABITS
Harvest and Feeding Habitats of Largemouth Bass (Micropterus Salmoides) in Murphy Flowage, Wisconsin,
W72-14114 8I

Observations on the Food and Feeding Behavior of the Common Bombay Catfish: Tachysurus Sona (HAM),
W72-14143 2I

FERMENTATION
Development of Lactic Acid Bacteria During Early Stages of Fermentation in Fish Silage,
W72-13683 5A

FERTILITY
Improvement of Soils By Cultivation in the Non-Chernozem Zone, (In Russian).
W72-14180 3F

FERTILIZER TECHNOLOGY
Fertilizer Technology and Use.
W72-14101 3F

FERTILIZERS
Spectrophotometric Method for Determining Low Levels of Water-Soluble Boron in Fertilizers,
W72-13782 5A

Effects of Cultural Practices and Fertilizers on Sugar Beet Quality,
W72-14139 5C

Determination of the Reserve of Available Phosphates in Irrigated Soils (In Russian),
W72-14169 5B

Problems of Interaction of Mineral Fertilizers and Irrigation on Certain Types of Hungarian Soils, (In Russian),
W72-14172 3F

Yield and Water Consumption of the Plants Grown in Pots as Influenced by Soil Structure, (In Rumanian),
W72-14173 2G

Reaction of Surface-Applied Superphosphate with Soil: I. The Fertilizer Solution and its Initial Reaction With Soil,
W72-14198 5B

FIBERS
Factors Affecting the Flexural Strength of Steel Fibrous Concrete,
W72-13754 8F

FILTRATION
Sewage Treating Apparatus and Method,
W72-13900 5D

FISH
PCBs in Fish from the Milwaukee Region,
W72-13652 5C

Development of Lactic Acid Bacteria During Early Stages of Fermentation in Fish Silage,
W72-13683 5A

Thermal Aquaculture: Engineering and Economics,
W72-13743 6B

Strontium-90 and Cesium-137 in Canned Seafood, Taiwan, Republic of China, 1970-1971,
W72-13990 5A

FISH BEHAVIOR
Olfaction in Parent Stream Selection by the Alewife (Alosa pseudoharengus),
W72-13675 2I

FISH CONSERVATION
Thermal Aquaculture: Engineering and Economics,
W72-13743 6B

FISH CONTROL AGENTS
Life History and Ecology of the Gizzard Shad, Dorosoma Cepedianum (Le Sueur) With Reference to Elephant Butte Lake,
W72-13927 2H

FISH DIETS
Some Observations on the Food of the Gwyniad Coregonus Clupeoides pennantii Valenciennes of Llyn Tegid (Lake Bala), North Wales,
W72-13738 2H

FISH ESTABLISHMENT
Life History and Ecology of the Gizzard Shad, Dorosoma Cepedianum (Le Sueur) With Reference to Elephant Butte Lake,
W72-13927 2H

FISH FARMING
Growth of the Fathead Minnow (Pimephales Promelas) in Tertiary Treatment Ponds,
W72-13868 5C

FISH FAUNA
The Fish Fauna of the Estuarine Area of the Rhine and Meuse Rivers,
W72-14153 5B

FISH GROWTH
Growth of the Fathead Minnow (Pimephales Promelas) in Tertiary Treatment Ponds,
W72-13868 5C

FISH PHYSIOLOGY
Osmotic Acclimation in the Red River Pupfish, Cyprinodon rubrofluviatilis,
W72-13680 2I

Activity Response to Chlorine in the Brook Trout, Salvelinus Fontinalis (Mitchell),
W72-13867 5C

A Continuously Monitored Respiration Chamber for Fish,
W72-13872 5A

Some Haematological and Metabolic Changes in Fish Occurring After Pesticide Intoxication (Nektere Hematologicke A Metabolicke Zmenyuryb po Intoxikaci Pesticidy),
W72-13873 5C

FISH POPULATIONS
The Ichthyofauna and Flora of Lake St. Louis on the St. Lawrence River Near Montreal, Quebec: General Features and Recent Changes,
W72-13647 5C

A Distributional Study of Missouri Fishes,
W72-13910 2I

Life History of the Eastern Johnny Darter, Etheostoma Olmstedi Storer, in Cold Tailwater and Sewage-Polluted Water,
W72-13998 5C

FISH PROTEIN CONCENTRATE
Concentration of Mercury in the Manufacture of Fish Protein Concentrate by Isopropyl Alcohol Extraction of Sheepshead and Carp,
W72-13869 5C

FISH TOXINS
Comparative Effects of Aquatic Biotoxins on Cardiac Systems,
W72-14056 5C

FISHERY
The Effects of Increasing Salinity on the Pyramid Lake Fishery,
W72-14054 5C

FJORDS
Distribution Patterns for Some Particulate and Dissolved Trace Metals Within an Active Glacial Fjord,
W72-13973 5B

FLEXIBILITY
Small Diameter Sand Drains,
W72-13756 8D

FLEXURAL STRENGTH
Microcracking Effect on Flexural Strength of Concrete After Repeated Loading,
W72-13744 8F

Factors Affecting the Flexural Strength of Steel Fibrous Concrete,
W72-13754 8F

FLOCCULATING AGENTS
Use of Chemicals to Maintain Clear Water for Drilling,
W72-13628 8C

FLOCCULATION
Chemical Removal of Drilled Solids,
W72-13624 8G

FLOOD CONTROL
Laneport, North Fork and South Fork Lakes, San Gabriel River, Texas (Draft Environmental Impact Statement).
W72-13956 8A

Kingstree Branch Flood Control Project, South Carolina (Draft Environmental Impact Statement).
W72-13960 4A

Authorized China Meadows Dam and Reservoir Lyman Project, Wyoming (Draft Environmental Impact Statement).
W72-13963 8D

FLOOD DAMAGE
Flooding Along the Rio Piedras in the San Juan Area, Puerto Rico,
W72-13714 7C

Flood Plain Information, Talkeetna River-Susitna River-Chulitna River, Talkeetna, Alaska.
W72-13836 4A

California High Water, 1969-1970,
W72-14013 2E

FLOOD DATA
California High Water, 1969-1970,
W72-14013 2E

FLOOD FORECASTING
A Statistical Analysis of Base-Flow Flood Discharge Data,
W72-13700 2E

FLOOD PLAINS
Flooding Along the Rio Piedras in the San Juan Area, Puerto Rico,
W72-13714 7C

Flood Plain Information, Talkeetna River-Susitna River-Chulitna River, Talkeetna, Alaska.
W72-13836 4A

FLOOD PROFILES
Flooding Along the Rio Piedras in the San Juan Area, Puerto Rico,
W72-13714 7C

FLOOD PROTECTION
Dively Drainage and Levee District (District 23), Illinois (Draft Environmental Impact Statement).
W72-13955 8D

Stuart Gulch Dam, Idaho (Final Environmental Impact Statement).
W72-13968 8D

FLOOD RECURRENCE INTERVAL
Dynamics of Flood Frequency,
W72-14003 2E

FLOODS
Flooding Along the Rio Piedras in the San Juan Area, Puerto Rico,
W72-13714 7C

On Some Modifications in the Venetian Climate During the Last Thirty Years: Repercussions of the Phenomenon of Flood Waters,
W72-13757 2B

Flood Plain Information, Talkeetna River-Susitna River-Chulitna River, Talkeetna, Alaska.
W72-13836 4A

Dynamics of Flood Frequency,
W72-14003 2E

California High Water, 1969-1970,
W72-14013 2E

FLORIDA
Proceedings of the Land Spreading Conference at Orlando, Florida on July 15, 1971.
W72-13704 5D

Wastewater Renovation at Tallahassee - Experimental Studies,
W72-13711 5D

Environmental Geology and Hydrology, Tallahassee Area, Florida.
W72-13740 6D

Analysis--Florida Water Resources Act of 1972, (Chapter 72-299, Laws of Florida).
W72-13944 6E

FLOTATION
Flow Stabilizing Through Laminar Separation Apparatus,
W72-13877 5D

FLOTSAM
Floating Flexible Skimming Devices,
W72-13891 5G

FLOW
Channel Network of a Basin and Formation of Runoff (Ruslovaya set' basseyna i protsess formirovaniya stoka vody),
W72-13853 2E

Calculation of Rate of Extension of Ice Cover in Afterbays of Reservoirs (Raschet nastupleniya kromki ledyanogo pokrova v nizhikh b'yefakh vodokhranilishch),
W72-14033 2C

Hydrodynamics of Free-Boundary Flows,
W72-14040 8B

FLOW CHARACTERISTICS
Electric Analog Studies of Flow to Wells in the Punjab Aquifer of West Pakistan,
W72-13735 2F

Selected Streamflow Characteristics as Related to Channel Geometry of Perennial Streams in Colorado,
W72-13736 2E

FLUID-BED EVAPORATORS
Exploratory Study of Brine Disposal Using Fluid-Bed Evaporation,
W72-14063 5E

FLUID MECHANICS
Hydrodynamics of Free-Boundary Flows,
W72-14040 8B

FLUIDIZED GRANULAR BEDS
Biological Denitrification Using Fluidized Granular Beds,
W72-14047 5D

FLUORIDES
Determination of Fluoride in Vegetation Using the Specific Ion Electrode,
W72-13789 5A

FOG
Use of Zaytsev Method for Determining the Water Content of Fogs in Chambers,
W72-13863 7B

FOLIAGE
A Device for Measuring and Recording the Amount and Duration of Free Water on Vegetation in the Field,
W72-14094 3F

FOOD CHAINS
Regularities of Sr90 and Cs137 Circulation in Different Links of Food Chain in Zoocoenosis,
W72-13801 5B

FOOD COMPETITION
Intraspecific Competition in Lake-Dwelling Triclads: A Laboratory Study,
W72-14132 2H

FOOD HABITS
Study of Environmental Impacts of Alternative Long Island Sound Bridge Sites,
W72-13907 6G

FOODS
Concentration of Mercury in the Manufacture of Fish Protein Concentrate by Isopropyl Alcohol Extraction of Sheepshead and Carp,
W72-13869 5C

FORAGE PLANTS
Water Profile Fluctuations Recorded Beneath Some Forage Plants During the Dry Season Using the Neutron Method, (In French),
W72-14138 7B

FORAMINIFERA
Sampling and Spatial Distribution of Benthonic Foraminifera,
W72-13674 5A

FORECASTING
Hydrologic Investigations, Computations, and Forecasts (Voprosy gidrologicheskikh issledovaniy, raschetov i prognozov).
W72-13854 4A

Hydrologic Computations and Forecasts (Voprosy gidrologicheskikh raschetov i prognozov).
W72-14038 4A

FORESHORE SLOPE
Inverse Relation Between Foreshore Slope and Mean Grain Size as a Function of the Heavy Mineral Content,
W72-14016 2J

FOREST MANAGEMENT
Development of Forest Management Practices for Increasing Snowpack Water Yield,
W72-13995 2C

Use of Forest Attributes in Snowpack Inventory - Prediction Relationships for Arizona Ponderosa Pine,
W72-13996 2C

FOREST MANAGEMENT GUIDELINES
Development of Forest Management Practices for Increasing Snowpack Water Yield,
W72-13995 2C

FORESTRY
A Radiation Mole Flow-Moisture Meter,
W72-13862 7B

FOSSIL DIATOMS
Evidence for the Eutrophication of Lake Ontario from the Sedimentary Diatom Succession,
W72-13641 5C

FOTONIC SENSOR
Control of Concentration Polarization in Reverse Osmosis Desalination of Water,
W72-14080 3A

FOUNDATIONS
Analysis of Uncertainty in Settlement Prediction,
W72-13745 8D

A Study of Anchorages for Transmission Tower Foundations,
W72-13750 8C

FRANCE
The Main Physico-Chemical Characteristics of Soils of the Vertisal and Sodium-Containing Type in the Rochefort Marsh at St-Laurent-De-La-Pree (Maritime Charente, France),
W72-14190 2G

FREEZING
A Device for Collecting In-Situ Samples of Suspended Sediment for Microscopic Analysis,
W72-13693 5A

Freezing Process Studies,
W72-14070 3A

FREQUENCY ANALYSIS
Dynamics of Flood Frequency,
W72-14003 2E

FRESHWATER
Effect of pH on the Filtration of Aquatic Humus Using Gels and Membranes,
W72-13681 5A

Physics of Freshwater Ice (Fizika presnovodnogo l'da),
W72-14037 2C

FRESHWATER AQUIFERS
General Ground-Water Quality in Fresh-Water Aquifers of Delaware,
W72-13832 5B

FRESHWATER FISH
W72-13864 5C

FRESHWATER ICE
Physics of Freshwater Ice (Fizika presnovodnogo l'da),
W72-14037 2C

FRESNO COUNTY (CALIF)
Prehistoric Near-Surface Subsidence Cracks in Western Freshno County, California,
W72-13717 2E

FROST PREVENTION
Let Your Irrigation System Do All the Work,
W72-13911 3F

FROZEN SOILS
Use of Capillary Columns to Study Infiltration of Water Into Frozen Soil (Skhema kapillyarnykh kolonn dlya vpityvaniya vody v merzlyy grunt),
W72-14031 2G

FRUITING
The Effect of Fruiting Upon Transpiration Rate and Stomatal Opening in Apple Leaves,
W72-14097 3F

FUEL OIL
Oil Pollution: Persistence and Degradation of Spilled Fuel Oil,
W72-13810 5B

FUNGI
Reaction of Soil Fungi and Other Microorganisms to Various Levels of Nitrogen Fertilization and Irrigation of Cocksfoot (Dactylis Glomerata L.). (In Polish),
W72-14158 5C

FURROW IRRIGATION
Sprinkle, Furrow and Trickle Irrigation of Muskmelon in an Arid Zone,
W72-14090 3F

GAGES
An Electronic Groundwater-Level Detector with Automatic Output Registration,
W72-13729 7B

GALVESTON BAY
Model Studies of Outfall Systems for Desalination Plants (Part II - Estuary Models),
W72-14064 5B

GAMING-SIMULATION
The River Basin Model: Chairman and Council.
W72-13930 6A

GAMMA RADIATION
Radiation Treatment of Materials,
W72-13883 5D

GARDNO LAKE
The Plankton of Lake Gardno Near the Baltic Sea During the Summer Season,
W72-13637 5C

GAS CHROMATOGRAPHY
Characterization of Gas Chromatographic Effluents Via Scanning Fluorescence Spectrometry,
W72-13672 5A

Determination of Diethylstilbestrol in Cattle Tissues,
W72-13677 5A

Studies on the Determination of Physiological Levels of Chromium in Serum by Gas Chromatography,
W72-13767 5A

Gas Liquid Chromatographic Analysis of Hydrocarbon Mixtures. A Report on the Work of the International Conference of Benzole Producers,
W72-13771 5A

An Artifact in the Gas Chromatographic Determination of Impurities in Pentachlorophenol,
W72-13774 5A

The Analysis of Trace Organics in Fresh Water by Gas Chromatography -- Mass Spectroscopy,
W72-14057 5A

GAS INJECTION
Fluid Separation,
W72-13890 5G

GAS LIQUID CHROMATOGRAPHY
Gas Liquid Chromatographic Analysis of Hydrocarbon Mixtures. A Report on the Work of the International Conference of Benzole Producers,
W72-13771 5A

GAUYA RIVER
Development of the Gauya River Valley (Razvitiye doliny reki Gauya),
W72-14034 2J

GEL FILTRATION
Effect of pH on the Filtration of Aquatic Humus Using Gels and Membranes,
W72-13681 5A

GELS
Anomalous Water,
W72-13842 1B

GEOCHEMISTRY
Contribution to the Geochemistry of Groundwater in Northern Germany,
W72-13725 2K

Marin Environmental Quality, Suggested Research Programs for Understanding Man's Effect on the Oceans.
W72-13903 5A

The Geochemistry of Radiocarbon in the Gulf of Mexico,
W72-13981 5B

GEOLOGICAL SURVEYS
Geological Considerations of Sanitary Landfill Site Evaluations,
W72-13719 5B

GEOLOGY
Environmental Geology and Hydrology, Tallahassee Area, Florida.
W72-13740 6D

Geologic Cross Sections Derived from Seismic Profiles and Sediment Cores from Southern Lake Michigan,
W72-13844 2J

Topography and Recent Sediments of the Littoral Zone of Soviet Far Eastern Seas (Osobennosti formirovaniya rel'yefa i sovremennykh osadkov pribrezhnoy zony dal'nevostochnykh morey SSSR).
W72-13860 2J

Development of the Gauya River Valley (Razvitiye doliny reki Gauya),
W72-14034 2J

GEOMORPHOLOGY
Geologic Cross Sections Derived from Seismic Profiles and Sediment Cores from Southern Lake Michigan,
W72-13844 2J

Topography and Recent Sediments of the Littoral Zone of Soviet Far Eastern Seas (Osobennosti formirovaniya rel'yefa i sovremennykh osadkov pribrezhnoy zony dal'nevostochnykh morey SSSR).
W72-13860 2J

Nonantecedent Development of Truckee River Canyon, Northern Carson Range, Nevada and California,
W72-14015 2J

Morphometric Analysis of Polygonal Karst in New Guinea,
W72-14018 2J

Longitudinal Profiles of Ephemeral Streams in Southeastern Arizona,
W72-14021 2E

Development of the Gauya River Valley (Razvitiye doliny reki Gauya),
W72-14034 2J

New Investigations of Shore Processes (Novyye issledovaniya beregovykh protsessov).
W72-14036 2J

GEORGIA
Digital Simulation of Thunderstorm Rainfall,
W72-13634 2B

GEORGIAN BAY (ONTARIO)
A Case of Nutrient Enrichment in an Inshore Area of Georgian Bay,
W72-13662 5C

GERMANY
Contribution to the Geochemistry of Groundwater in Northern Germany,
W72-13725 2K

Water Plant Communities in Eastern Lower Saxony (I and II), (In German),
W72-14117 5C

GERMINATION
Emergence, Early Growth, and Salinity of Five Vegetable Crops Germinated by Sprinkle and Trickle Irrigation in an Arid Zone,
W72-14106 3F

Effect of Saline Waters on the Germination of Watermelon (Citrullus Vulgaris Schrad. ex Eckl. et Zeyh.),
W72-14126 3C

GLACIERS
Distribution Patterns for Some Particulate and Dissolved Trace Metals Within an Active Glacial Fjord,
W72-13973 5B

GLASS EFFECT
Glass Effect and the Microbial Plankton-Seston Relation in the Water of Lakes Balaton and Belso,
W72-14161 5C

GLASS FIBER FILTERS
A Quantitative Comparison of Pigment Extraction by Membrane and Glass-Fiber Filters,
W72-13673 5A

GLYCOLYSIS
Certain Features of Respiratory Metabolism of Plants Under Conditions of an Increasing Water Deficiency, (In Russian)
W72-14195 3F

GOLONOG FOREST
Tentative Evaluation of Industrial Damage in Stands of the Golonog Forest District,
W72-14095 5C

GOVERNMENT SUPPORTS
Rural Environmental Assistance Program (Draft Environmental Impact Statement).
W72-13953 5G

GOVERNMENTAL PROCESSES
The River Basin Model: Chairman and Council.
W72-13930 6A

GRANTS
Award of P.L. 660 Grant for Construction of Wastewater Treatment Facilities and Outfall Sewers--Project No. WPC-TEX-722 (Draft Environmental Impact Statement).
W72-13949 5D

GRASS CARP
The Elements of Energy Balance in Grass Carp (CtenopharyngodonIdella Val.): I,
W72-13815 2I

GRASSES
Seedbed Preparation and Seeding Methods to Establish Grassed Waterways,
W72-13914 4A

GREAT GULL ISLAND (NY)
Pollutant Concentrations in Abnormal Young Terns from Long Island Sound,
W72-14134 5C

GREAT LAKE WATER QUALITY AGREEMENT
Signing of Great Lakes Water Quality Agreement, April 15.
W72-13947 5G

GREAT LAKES
Proceedings, Fourteenth Conference on Great Lakes Research.
W72-13640 5C

Electrodialysis: A Method for Extracting Available Nutrients in Great Lakes Sediments,
W72-13658 5C

Symposium: Public Involvement in the Water Management Problems in the Great Lakes,
W72-13665 5C

Signing of Great Lakes Water Quality Agreement, April 15.
W72-13947 5G

GREENHOUSES
Controlled-Environment Vegetable Production: Results of Trials at Puerto Penasco, Mexico, 1968-1970,
W72-13926 3F

GROUNDWATER
Enteric Viruses in Ground and Surface Waters: A Review of their Occurrence and Survival,
W72-13611 5F

Water-Quality Reconnaisance of the Lower Santa Ana River Canyon, Southern California,
W72-13720 2K

Nitrate Contamination of the Water-Table Aquifer in Delaware,
W72-13834 5B

Investigations of Organic Matter in Groundwater of Oil- and Gas-Bearing Regions (Metodicheskiye issledovaniya v oblasti izucheniya organicheskogo veshchestva pcdzemnykh vod neftegazonosnykh oblastey),
W72-13856 5B

Use of Water in Arkansas, 1970,
W72-14028 6D

GROUNDWATER MINING
Economic Efficiency in the Allocation of Irrigation Water Over Time,
W72-13823 6B

GROUNDWATER MOVEMENT
Electric Analog Studies of Flow to Wells in the Punjab Aquifer of West Pakistan,
W72-13735 2F

Nonsteady Flow in a Recharge Well-Unconfined Aquifer System,
W72-13828 2F

Ground-Water Outflow from Chino Basin, Upper Santa Ana Valley, Southern California,
W72-13838 2F

Sea Water Intrusion: Morro Bay Area, San Luis Obispo County,
W72-13846 2L

Digital Computer Modeling of Limestone Groundwater Systems,
W72-14001 2F

Transformation of the Tensor Form of Darcy's Law in Inhomogeneous and Anisotropic Soils,
W72-14055 2F

GROUNDWATER QUALITY
General Ground-Water Quality in Fresh-Water Aquifers of Delaware,
W72-13832 5B

GROUNDWATER RESOURCES
Ground Water in Kearny County, Southwestern Kansas,
W72-13715 7C

Ground-Water Resources of McLean County, West-Central North Dakota,
W72-13716 7C

General Ground-Water Quality in Fresh-Water Aquifers of Delaware,
W72-13832 5B

Geology and Ground Water, University of Delaware, Newark, Delaware,
W72-13833 4B

Ground-Water Geology of the Delaware Atlantic Seashore,
W72-13835 2F

Ground-Water Occurrence in the Maryland Piedmont,
W72-13848 2F

Water Law--Groundwater Rights in Missouri--A Need for Clarification (Higday V. Nickolaus),
W72-13939 6E

Groundwater Resources of Saline County, Missouri,
W72-14011 2F

Ground-Water Conditions in Utah, Spring of 1972,
W72-14023 4B

Records of Wells in Harris County, Texas, 1892-1972,
W72-14027 4B

Development of Ground Water in the El Paso District, Texas, 1963-70,
W72-14029 2F

GROWTH
Effect of Cyclamates on the Growth of Pullularia Pullulans,
W72-13814 5C

Growth of Salmonella Typhimurium in Skim Milk Concentrates,
W72-13818 5A

Tilapia Fishery in Lake Maruit: Age and Growth of Tilapia Nilotica L. In The Lake,
W72-14000 2H

GROWTH DETERMINATION
Growth of Known Age Muskellunge (Esox Masquinongy) in Wisconsin and Validation of Age and Growth Determination Methods,
W72-14110 2I

GROWTH RATES
The Present Status and Future Prospect of the Turbidostat,
W72-13772 5A

Chlorinated Hydrocarbon, Microparticulate Effects on Microorganisms Isolated from Lake Erie,
W72-13999 5C

GULF COASTAL PLAIN
Red River Waterway and Red River Waterway Emergency Bank Protection, Mississippi River to Vicinity of Index, Arkansas, Louisiana, Arkansas, Oklahoma, and Texas (Draft Environmental Impact Statement).
W72-13952 8A

GULF OF FINLAND
Estimating the Wetting of Walls by Driving Rain (Ob otsenke uvlazheniya sten pri kosykh dozhydakh),
W72-13855 7B

GULF OF MEXICO
The Geochemistry of Radiocarbon in the Gulf of Mexico,
W72-13981 5B

GULF OF ST. LAWRENCE
Sampling and Spatial Distribution of Benthonic Foraminifera,
W72-13674 5A

Salinity Tolerances of Some Common Prosobranchs,
W72-13795 5C

GWYNIAD
Some Observations on the Food of the Gwyniad Coregonus Clupeoides pennantii Valenciennes of Llyn Tegid (Lake Bala), North Wales,
W72-13738 2H

HABITAT
Fish and Wildlife in the Marine and Coastal Zone, Part A, Summary Planning Information, and Recommendations,
W72-13908 6G

HABITATS
Study of Environmental Impacts of Alternative Long Island Sound Bridge Sites,
W72-13907 6G

HALOGENATED PESTICIDES
An Artifact in the Gas Chromatographic Determination of Impurities in Pentachlorophenol,
W72-13774 5A

HALOGENS
Process for Treating Water with a Polyhalide Resin Using a Semipermeable Membrane Barrier,
W72-13887 5F

HAMILTON (ONTARIO)
A Survey of Housewives' Attitudes,
W72-13664 5C

HARBORS
Preliminary Report on Techniques for Marine Monitoring Systems,
W72-13850 5B

Sandusky Harbor, Erie County, Ohio (Draft Environmental Impact Statement).
W72-13950 5G

HARPACTICOIDS
Horizontal and Vertical Distribution of the Interstitial Harpacticoid Copepods of a Sandy Beach,
W72-13783 5C

HARRIS COUNTY (TEX)
Records of Wells in Harris County, Texas, 1892-1972,
W72-14027 4B

HARTWELL RESERVOIR
Water Quality Predictions Based on Limnological Parameters,
W72-13825 5C

HAWAII
Weathering of Basaltic Tephra on the Island of Hawaii,
W72-14014 2J

HAY
Wheeler-Dealing: Jackpot in Hay,
W72-13921 3F

HEAT BALNACE
Problems in the Heat and Water Regime of Agricultural Lands (Voprosy teplovogo i vodnogo rezhima sel'skokhozyaystvennykh poley).
W72-13858 3F

HEAT RESISTANCE
Effect of Temperature on the Respiration and Cytochromes of an Extreme Thermophile,
W72-13765 5C

HEAT TRANSFER
Relation of Precipitation to Soil Temperature (2nd Report)--Effect of Soil Moisture on Heat-Exchange in the Soil,
W72-13845 2G

HEATED WATER
Esturine Ecosystems and High Temperatures,
W72-13636 5C

Mortality of Pacific Oysters (Crassotrea GI-Gas): The Influence of Temperature and Enriched Seawater on Oyster Survival,
W72-13875 5C

HEATS OF MIXING
Properties of Seawater and Its Concentrates and Related Solutions at Temperatures up to 400 Degrees F,
W72-14062 1B

HEAVY METALS
Wax-Bound Lead Dioxide Potentiometric Electrode and Applications to Chelometric Titration,
W72-13676 5A

Complexation of Metal Ions with Natural Polyelectrolytes (Removal and Recovery of Metal Ions from Polluted Waters),
W72-13776 5A

HEAVY MINERALS
Inverse Relation Between Foreshore Slope and Mean Grain Size as a Function of the Heavy Mineral Content,
W72-14016 2J

HEMATOLOGICAL CHANGES
Some Haematological and Metabolic Changes in Fish Occurring After Pesticide Intoxication (Nektere Hematologicke A Metabolicke Zmenyuryb po Intoxikaci Pesticidy),
W72-13873 5C

HEPTACHLOR
Chlorinated Hydrocarbon, Microparticulate Effects on Microorganisms Isolated from Lake Erie,
W72-13999 5C

HERBICIDES
Skeleton Weed (Chondrilla Juncea) in the Victorian Mallee: V. Chemical Fallowing,
W72-13708 3F

An Artifact in the Gas Chromatographic Determination of Impurities in Pentachlorophenol,
W72-13774 5A

W72-13864 5C

Declaring War....On Mesquite,
W72-13925 3B

HERRINGS
Salinity Tolerance of Young Blueback Herring, Alosa Aestivalis,
W72-13870 5C

HETEROTROPHIC BACTERIA
Effect of Pumping Freshwaters Into Oil Strata of the Perm Prikamje on the Distribution of Microflora, (In Russian),
W72-14135 5C

HETEROTROPHS
The Influence of Zala River on the Bacteriological Condition in Keszthely-Bay (Lake Balaton),
W72-14154 5C

HISTORY
Man--The Desert Farmer,
W72-13919 3F

HOUSEWIVES
A Survey of Housewives' Attitudes,
W72-13664 5C

HUDSON AND MOHAWK RIVERS (NEW YORK)
Aquatic Plant Control Program, Hudson and Mohawk Rivers, New York (Final Environmental Impact Statement).
W72-13967 4A

HUDSON RIVER
Aquatic Plant Control Program, Hudson and Mohawk Rivers, New York (Final Environmental Impact Statement).
W72-13967 4A

HUMAN DISEASES
Epidemiological and Ecological Aspects Due to the Construction of River Weirs in the Tropical Regions,
W72-13819 5C

HUMIDITY
On Nitrogen Forms in Dew or Frost Water: II. On the Changes of Nitrogen Dioxide in the Air, (In Japanese),
W72-14186 5B

HUMUS
Effect of pH on the Filtration of Aquatic Humus Using Gels and Membranes,
W72-13681 5A

HUNGARY
Cladocera Studies on Lake Balaton: IV. Subfossil Remains in the Sediments of Lake Balaton II,
W72-14160 2H

The Horizontal Distribution of Rotifera Plankton in Lake Balaton,
W72-14163 5C

Studies on the Course of Litter Decomposition in a Hungarian Quercetum-Petraeae-Cerris Forest Stand,
W72-14165 4A

Problems of Interaction of Mineral Fertilizers and Irrigation on Certain Types of Hungarian Soils, (In Russian),
W72-14172 3F

HYCROGEOLOGY
Geology and Ground Water, University of Delaware, Newark, Delaware,
W72-13833 4B

HYDRAULIC DESIGN
Riprapped Basins for Culvert Outfalls,
W72-13751 8A

HYDRAULIC ENGINEERING
A Survey of Indexing and Abstracting Services for Water Resources Engineering,
W72-13820 10B

HYDRAULIC FLOW RATE
Application of Inorganic Ion Exchange MEMBRANES TO Electrodialysis,
W72-14081 3A

HYDRAULIC MODELS
An Experimental Study of the Growth of Mechanically Generated Surface Water Waves When Subjected to a Fully Developed Turbulent Channel Airflow,
W72-13734 2E

HYDRAULICS
Techniques and Hydrulic Verification of Hydrometric Studies (Metodika i gidravlicheskoye obosnovaniye gidrometricheskikh rabot).
W72-13861 8B

HYDROCARBONS
A Review of the Methods for the Identification of Persistent Hydrocarbon Pollutants on Seas and Beaches,
W72-13766 5A

Gas Liquid Chromatographic Analysis of Hydrocarbon Mixtures. A Report on the Work of the International Conference of Benzole Producers,
W72-13771 5A

HYDRODYNAMICS
Hydrodynamics of Free-Boundary Flows,
W72-14040 8B

HYDROGEN ION CONCENTRATION
Effect of pH on the Filtration of Aquatic Humus Using Gels and Membranes,
W72-13681 5A

The Removal of Radionuclides From Water by Hydrous Ferric Oxide,
W72-13699 5D

Studies on the Behaviours and Distribution of Radioactive Substances in Coastal and Estuarine Waters,
W72-13976 5B

HYDROGEOLOGY
Ground Water in Kearny County, Southwestern Kansas,
W72-13715 7C

Review of Geohydrological Activities in the Netherlands Since World War II, In Particular of the Government Institute for Water Supply,
W72-13721 2F

Geohydrological Investigations with a View to Groundwater Catchment--A Case History,
W72-13723 4B

Fresh Water Winning and Salt Water Encroachment in the Amsterdam Dune Water Catchment Area,
W72-13724 4B

Contribution to the Geochemistry of Groundwater in Northern Germany,
W72-13725 2K

The Use of Geohydrology in Solving Water Management Problems in Agriculture,
W72-13726 4B

Recent Developments of Physical Investigations in Boreholes and Wells,
W72-13727 4B

Application of Natural Isotopes in Ground Water Hydrology,
W72-13728 2F

Permeability Distribution in a Holocene Distributary Channel-Fill Near Leerdam (The Netherlands),
W72-13730 2J

Application of Models in Geohydrological Investigations,
W72-13731 2A

The Genesis of Selected Hydrochemical Facies in Baton Rouge, Louisiana, Ground Waters,
W72-14008 2F

Morphometric Analysis of Polygonal Karst in New Guinea,
W72-14018 2J

Hydrogeological Studies in the Captation Area of the Loisach River Between Garmisch-Partenkirchen and Eschenlohe/OBB,
W72-14148 2E

HYDROGRAPHS
Distribution Patterns for Some Particulate and Dissolved Trace Metals Within an Active Glacial Fjord,
W72-13973 5B

HYDROGRAPHY
Dynamics of Phytoplankton Primary Production and Biomass in Loviisa Archipelago (Gulf of Finland),
W72-13871 5C

HYDROLOGIC ASPECTS
Hydrologic Investigations, Computations, and Forecasts (Voprosy gidrologicheskikh issledovaniy, raschetov i prognozov).
W72-13854 4A

Hydrologic Computations and Forecasts (Voprosy gidrologicheskikh raschetov i prognozov).
W72-14038 4A

HYDROLOGIC DATA
Test-Observation Well Near Davenport, Washington: Description and Preliminary Results,
W72-13733 4B

Surface Water Supply of the United States, 1961-65, Part 1. North Atlantic Slope Basins--Volume 2. Basins from New York to Delaware.
W72-13827 7C

Hydrologic Investigations, Computations, and Forecasts (Voprosy gidrologicheskikh issledovaniy, raschetov i prognozov).
W72-13854 4A

Ground-Water Conditions in Utah, Spring of 1972,
W72-14023 4B

Hydrologic Computations and Forecasts (Voprosy gidrologicheskikh raschetov i prognozov).
W72-14038 4A

HYDROLOGIC MODELS
Digital Simulation of Thunderstorm Rainfall,
W72-13634 2B

An Integration of the Agricultural Demand Function for Water and the Hydrologic Model of the Pecos Basin,
W72-13993 6D

HYDROLOGIC SYSTEMS
U234/U238 Disequilibrium in Groundwaters of Central Texas,
W72-13971 5B

HYDROLOGY
Environmental Geology and Hydrology, Tallahassee Area, Florida.
W72-13740 6D

Limnology of Oneida Lake with Emphasis on Factors Contributing to Algal Blooms,
W72-13851 5C

Hydrologic Investigations, Computations, and Forecasts (Voprosy gidrologicheskikh issledovaniy, raschetov i prognozov).
W72-13854 4A

Problems in Hydrologic Instrumentation (Voprosy gidrologicheskogo priborostroyeniya).
W72-13859 7B

Hydrologic Computations and Forecasts (Voprosy gidrologicheskikh raschetov i prognozov).
W72-14038 4A

HYDROMETRY
Problems in Hydrologic Instrumentation (Voprosy gidrologicheskogo priborostroyeniya).
W72-13859 7B

Techniques and Hydrulic Verification of Hydrometric Studies (Metodika i gidravlicheskoye obosnovaniye gidrometricheskikh rabot).
W72-13861 8B

HYPERFILTRATION
Water Transport in Hyperfiltration Membranes,
W72-14072 3A

Transport Processes in Hyperfiltration Membranes I,
W72-14083 3A

HYPERTROPHIC GROWTH
Hypertrophic Growth,
W72-13668 5C

HYPOIODOUS ACID TABLETS
Evaluation of the Hypoiodous Iodine Tablet - Phase II,
W72-13701 5F

HYPOLIMNION
Hypothesis for Dissolved Oxygen Depletion in the Central Basin Hypolimnion of Lake Erie,
W72-13659 5C

HYPOXIA
A Re-Evaluation of the Anaerobic Endproducts of Freshwater Fish Exposed to Environmental Hypoxia,
W72-14093 5C

Respiratory and Circulatory Responses of Rainbow Trout Larvae to Carbon Monoxide and to Hypoxia,
W72-14146 5C

ICE
Calculation of Rate of Extension of Ice Cover in Afterbays of Reservoirs (Raschet nastupleniya kromki ledyanogo pokrova v nizhikh b'yefakh vodokhranilishch),
W72-14033 2C

Physics of Freshwater Ice (Fizika presnovodnogo l'da),
W72-14037 2C

ICE COVER
Calculation of Rate of Extension of Ice Cover in Afterbays of Reservoirs (Raschet nastupleniya kromki ledyanogo pokrova v nizhikh b'yefakh vodokhranilishch),
W72-14033 2C

Physics of Freshwater Ice (Fizika presnovodnogo l'da),
W72-14037 2C

ICE CRYSTALS
Physics of Freshwater Ice (Fizika presnovodnogo l'da),
W72-14037 2C

ICE PROPERTIES
Calculation of Rate of Extension of Ice Cover in Afterbays of Reservoirs (Raschet

nastupleniya kromki ledyanogo pokrova v nizhikh b'yefakh vodokhranilishch),
W72-14033 2C

Physics of Freshwater Ice (Fizika presnovodnogo l'da),
W72-14037 2C

ICE STRUCTURE
Physics of Freshwater Ice (Fizika presnovodnogo l'da),
W72-14037 2C

IDAHO
Stuart Gulch Dam, Idaho (Final Environmental Impact Statement).
W72-13968 8D

ILLINOIS
Dively Drainage and Levee District (District 23), Illinois (Draft Environmental Impact Statement).
W72-13955 8D

IMPACT (RAINFALL)
Estimating the Wetting of Walls by Driving Rain (Ob otsenke uvlazheniya sten pri kosykh dozhydakh),
W72-13855 7B

INCUBATION PERIODS
Inorganic Phosphate Fractions in Calcareous Soils in Relation to Moisture and Incubation Period,
W72-14189 2G

INDEXING
A Computerized System for Storing, Retrieving, and Correlating NMR Data,
W72-13808 7C

A Survey of Indexing and Abstracting Services for Water Resources Engineering,
W72-13820 10B

INDIAN OCEAN
Anomalous Th228/Th232 and Th230/232 Activity Ratios in Backwater Sediments Along the West Coast of India.
W72-13982 5B

INDIANA
Indiana Water Quality, 1969, Monitor Station Records--Rivers and Streams.
W72-14045 7B

INDICATORS
Method and Means for Detecting Coliform Bacteria in Water,
W72-13881 5A

INDIVIDUAL SEWAGE DISPOSAL SYSTEMS
Requirements for Approval of Individual Sewage Disposal Systems.
W72-13943 5G

INDOLE
A New Reagent for Detecting Tryptophan, Indole, and Indole-3-Acetic Acid in Thin-Layer Chromatography,
W72-13773 5A

INDOLE-3-ACETIC ACID
A New Reagent for Detecting Tryptophan, Indole, and Indole-3-Acetic Acid in Thin-Layer Chromatography,
W72-13773 5A

INDOLEBUTYRIC ACID
Effect of Moisture Stress and Indolebutyric Acid on Rooting of Stem Cuttings of Pomegranate (Punica Granatum L.),
W72-14123 3F

INDUSTRIAL POLLUTION
Tentative Evaluation of Industrial Damage in Stands of the Golonog Forest District,
W72-14095 5C

INDUSTRIAL WASTES
An Example of Economic Plating Waste Treatment by Reverse Osmosis,
W72-13687 5D

Sprinkler Irrigation System Solves Waste Water Problems.
W72-13691 5D

Flow Stabilizing Through Laminar Separation Apparatus,
W72-13877 5D

Extracting Oil Waste,
W72-13888 5D

Fluid Separation,
W72-13890 5G

Floating Flexible Skimming Devices,
W72-13891 5G

Treatment of Waste Liquors from Pulp and Paper Mills,
W72-13896 5D

INDUSTRIAL WATER
Macroreticular Resins-A Solution To Aggressive Conditions,
W72-13690 5D

INFILTRATION
Some Aspects of Effluent Landspreading,
W72-13712 5D

Relation of Precipitation to Soil Temperature (2nd Report)--Effect of Soil Moisture on Heat-Exchange in the Soil,
W72-13845 2G

Perturbation Analysis of Two-Phase Infiltration,
W72-14006 2G

Use of Capillary Columns to Study Infiltration of Water Into Frozen Soil (Skhema kapillyarnykh kolonn dlya vpityvaniya vody v merzlyy grunt),
W72-14031 2G

Infiltration and Structural Changes as Influenced by Initial Moisture Content,
W72-14196 2G

Redistribution of Soil Water After Infiltration,
W72-14197 2G

INFILTRATION CAPACITY
Use of Capillary Columns to Study Infiltration of Water Into Frozen Soil (Skhema kapillyarnykh kolonn dlya vpityvaniya vody v merzlyy grunt),
W72-14031 2G

INFILTRATION RATES
Use of Capillary Columns to Study Infiltration of Water Into Frozen Soil (Skhema kapillyarnykh kolonn dlya vpityvaniya vody v merzlyy grunt),
W72-14031 2G

INFORMATION RETRIEVAL
A Survey of Indexing and Abstracting Services for Water Resources Engineering,
W72-13820 10B

INFRARED RADIATION
Tunable Infrared Laser Spectroscopy of Atmospheric Water Vapor,
W72-13732 2B

INFRARED SPECTROSCOPY
Sandwich KBr Disk for Scanning Volatile Pesticides,
W72-13811 5A

INHIBITION
Synchronization of Cell Division in Escherichia Coli by Elevated Temperatures: A Reinterpretation,
W72-13666 5C

DDT: Inhibition of Sodium Chloride Tolerance by the Blue-Green Alga Anacystis Nidulans,
W72-13809 5C

INHIBITIONS
Variation in the Toxicity of Arsenic Compounds to Microorganisms and the Suppression of the Inhibitory Effects by Phosphate,
W72-13813 5C

INJECTION WELLS
Nonsteady Flow in a Recharge Well-Unconfined Aquifer System,
W72-13828 2F

Experimental Injection of Tertiary-Treated Sewage in a Deep Well at Bay Park, Long Island, N. Y.--A Summary of Early Results,
W72-13839 5B

INSECT LARVAE
Efficiency of Sucrose Flotation in Recovering Insect Larvae From Benthic Stream Samples,
W72-14116 2I

INSECTICIDES
Endosulfan in the Rhine River,
W72-13847 5C

INSTITUTIONS
The Law and the Corporate Polluter: Flexibility and Adaption in the Developing Law of the Environment,
W72-13938 5G

INSTRUMENTATION
An Electronic Groundwater-Level Detector with Automatic Output Registration,
W72-13729 7B

On-Line Computer-Controlled Electrical Detection in Spark Source Mass Spectrometry,
W72-13770 7B

Gas Liquid Chromatographic Analysis of Hydrocarbon Mixtures. A Report on the Work of the International Conference of Benzole Producers,
W72-13771 5A

Measurements of Very Low Oxygen Tensions in Unstirred Liquids,
W72-13785 5A

A Study of Light Attenuation in Monterey Bay, California,
W72-13798 5A

Sandwich KBr Disk for Scanning Volatile Pesticides,
W72-13811 5A

Problems in Hydrologic Instrumentation (Voprosy gidrologicheskogo priborostroyeniya).
W72-13859 7B

Apparatus for Measuring Properties of a Fluid Body from an Airborne Vehicle,
W72-13876 7B

An Instrument for Continuous Recording of Natural Evaporation,
W72-14136 7B

INTERFACES
Study of Membrane-Solution Interfaces by Electro-Chemical Methods,
W72-14075 3A

INTERNATIONAL JOINT COMMISSION
Signing of Great Lakes Water Quality Agreement, April 15.
W72-13947 5G

INTERNATIONAL RIGHTS
Oil Pollution of the Marine Environment - A Legal Bibliography,
W72-13904 5G

INTERNATIONAL WATERS
Politics and the Colorado River,
W72-13915 6E

INUNDATION
Some Aspects of Effluent Landspreading,
W72-13712 5D

INVERTEBRATE PATHOLOGY
Mortality of Pacific Oysters (Crassotrea GI-Gas): The Influence of Temperature and Enriched Seawater on Oyster Survival,
W72-13875 5C

INVERTEBRATES
Epidemiological and Ecological Aspects Due to the Construction of River Weirs in the Tropical Regions,
W72-13819 5C

IODIDES
Analytical Uses of Charge-Transfer Complexation: Spectrophotometric Method for Iodide in Water,
W72-13792 5A

Versatile Colorimetric Coulometer,
W72-13802 2K

ION EXCHANGE
Macroreticular Resins-A Solution To Aggressive Conditions,
W72-13690 5D

Ion Exchange Apparatus for Treating Liquids,
W72-13885 3A

Influence of Strongly Bound Counter-Ions on Permselective Membranes,
W72-14073 3A

Application of Inorganic Ion Exchange MEMBRANES TO Electrodialysis,
W72-14081 3A

Continuing Development of a General Mechanistic Theory of Membrane Phenomena and Continuing Experimental and Theoretical Studies of Ion-Exchange Polarization Phenomena,
W72-14085 3A

ION EXCHANGE MEMBRANES
Continuing Development of a General Mechanistic Theory of Membrane Phenomena and Continuing Experimental and Theoretical Studies of Ion-Exchange Polarization Phenomena,
W72-14085 3A

ION SELECTIVE ELECTRODES
Titrimetric Determination of Trace Sulfur in Petroleum Using a Lead Ion Selective Electrode,
W72-13806 5A

ION TRANSPORT
Water Transport in Hyperfiltration Membranes,
W72-14072 3A

Transport Processes in Hyperfiltration Membranes I,
W72-14083 3A

Research on Ion Transport Across Microbial Membranes,
W72-14084 3A

Transport Property Requirements of Membranes for Use in Pressure Dialysis Desalination,
W72-14088 3A

IONS
Complexation of Metal Ions with Natural Polyelectrolytes (Removal and Recovery of Metal Ions from Polluted Waters),
W72-13776 5A

IOWA
Alluvial Cutoff Dating from Subsequent Growth of a Meander,
W72-14025 2J

IRON
An Intensive Biochemical Survey of Western Lake Erie,
W72-13654 5C

Spectrophotometric Determination of Trace Quantities of Iron (III) by an Exchange Reaction with Metal Acetylacetonates,
W72-13793 5A

The Concentrations of Cadmium, Copper, Iron, Manganese, Molybdenum, Nickel, Vanadium and Zinc in Part of the Tropical Northeast Atlantic Ocean,
W72-13985 5A

Brown and Gray Sands on the Virginia Shelf: Color as a Function of Grain Size,
W72-14017 2J

Chemical Factors that Influence the Availability of Iron and Manganese in Aqueous Systems,
W72-14022 5B

IRON COAGULANT
Removal of Impurities from Trickling Filter Effluents by Coagulation,
W72-13826 5D

IRON OXIDES
The Removal of Radionuclides From Water by Hydrous Ferric Oxide,
W72-13699 5D

IRON-STAINED SANDS
Brown and Gray Sands on the Virginia Shelf: Color as a Function of Grain Size,
W72-14017 2J

IRRIGATED LAND
Wheeler-Dealing: Jackpot in Hay,
W72-13921 3F

IRRIGATION
Soil Water Regime in Economic Evaluation of Salinity in Irrigation,
W72-13932 3C

Effect of Irrigating Wheat Crop at Different Stages,
W72-14151 3F

IRRIGATION EFFICIENCY
Soil Water Regime in Economic Evaluation of Salinity in Irrigation,
W72-13932 3C

IRRIGATION PRACTICES
Man--The Desert Farmer,
W72-13919 3F

IRRIGATION SYSTEMS
Sprinkler Irrigation System Solves Waste Water Problems.
W72-13691 5D

Let Your Irrigation System Do All the Work,
W72-13911 3F

IRRIGATION WATER
Economic Efficiency in the Allocation of Irrigation Water Over Time,
W72-13823 6B

Sulfuric Acid: Its Potential for Improving Irrigation Water Quality,
W72-13920 5G

Soil Water Regime in Economic Evaluation of Salinity in Irrigation,
W72-13932 3C

ISOPOD FAUNA
Littoral Oniscoids from the Thau Basin (Mediterranean Littoral Pond): Faunistic and Ecological Study (In French),
W72-14166 2H

ISRAEL
Fisheries and Fish Culture in Israel in 1970,
W72-14113 8I

IVORY COAST
The Use of Aerial Photos in Pedological Cartography of the Area of Transition Between the Tropical Forest and Savanna in the Central Ivory Coast,
W72-14129 7B

Water Profile Fluctuations Recorded Beneath Some Forage Plants During the Dry Season Using the Neutron Method, (In French),
W72-14138 7B

JET-BITS
Design and Operation of Jet-Bit Programs for Maximum Hydraulic Horsepower, Impact Force or Jet Velocity,
W72-13626 8C

JOINT WASTE WATER TREATMENT
The Northern Maine Regional Treatment System, Aroostook River-Prestile Stream, A Plan for Clean Water, Summary Report.
W72-14049 5D

JOINTS (CONNECTIONS)
The Influence of Reinforcement Detailing on the Strength of Concrete Structures,
W72-13753 8F

JUDICIAL DECISIONS
Water Law--Groundwater Rights in Missouri--A Need for Clarification (Higday V. Nickolaus),
W72-13939 6E

KANSAS
Ground Water in Kearny County, Southwestern Kansas,
W72-13715 7C

KARA-BOGAZ-GOL
Reduction of Runoff Into Kara-Bogaz-Gol and the Future Level of the Caspian Sea (Ogranicheniye stoka v zaliv Kara-Bogaz-Gol i budushchiy uroven' Kaspiyskogo morya),
W72-14032 2E

KARST
Morphometric Analysis of Polygonal Karst in New Guinea,
W72-14018 2J

KARST HYDROLOGY
Carbonate Chemistry of Aquifer and Stream Water in Kentucky,
W72-14004 2F

Morphometric Analysis of Polygonal Karst in New Guinea,
W72-14018 2J

KASHMIR
Ecology and Production of Salvinia Natans Hiffim; In Kasmir,
W72-14071 2H

KAZAKHSTAN
Erosion-Ameliorative Investigations of Soils in Kazakhstan, (In Russian),
W72-14174 4D

KEARNY COUNTY (KANS)
Ground Water in Kearny County, Southwestern Kansas,
W72-13715 7C

KENT COUNTY (DEL)
Nitrate Contamination of the Water-Table Aquifer in Delaware,
W72-13834 5B

KENTUCKY
Carbonate Chemistry of Aquifer and Stream Water in Kentucky,
W72-14004 2F

KESZTHELY-BAY
The Influence of Zala River on the Bacteriological Condition in Keszthely-Bay (Lake Balaton),
W72-14154 5C

KINETICS
Process Modeling of Biological Waste Treatment,
W72-13694 5D

An Experimental Study of the Structure, Thermodynamics and Kinetic Behavior of Water,
W72-14060 1B

KINGSTREE BRANCH PROJECT (SC)
Kingstree Branch Flood Control Project, South Carolina (Draft Environmental Impact Statement).
W72-13960 4A

KRASNODAR
The Structural Composition and Water Stability of Podzolized Brown Forest Soils in the Krasnodar Territory, (In Russian),
W72-14178 2G

LABORATORY EQUIPMENT
Versatile Colorimetric Coulometer,
W72-13802 2K

A Continuously Monitored Respiration Chamber for Fish,
W72-13872 5A

LABORATORY TESTS
Investigation of Sinking Methods for Removal of Oil Pollution from Water Surfaces. Phase II. Methods of Test for Laboratory Evaluation of Oil Sinking Materials,
W72-13702 5G

LACTIC ACID BACTERIA
Development of Lactic Acid Bacteria During Early Stages of Fermentation in Fish Silage,
W72-13683 5A

LAHONTAN CUTTHROAT TROUT
The Effects of Increasing Salinity on the Pyramid Lake Fishery,
W72-14054 5C

LAKE BALATON
Cladocera Studies on Lake Balaton: IV. Subfossil Remains in the Sediments of Lake Balaton II,
W72-14160 2H

Glass Effect and the Microbial Plankton-Seston Relation in the Water of Lakes Balaton and Belso,
W72-14161 5C

The Horizontal Distribution of Rotifera Plankton in Lake Balaton,
W72-14163 5C

LAKE BELSO
Glass Effect and the Microbial Plankton-Seston Relation in the Water of Lakes Balaton and Belso,
W72-14161 5C

LAKE BEMIDJI (MINN)
Patterns of Lakeshore Usage Around Lake Bemidji,
W72-14131 5C

LAKE BERRYESSA
Harvest, Survival, and Cost of Two Domestic Strains of Tagged Rainbow Trout Stocked in Lake Berryessa, California,
W72-14181 2H

LAKE ERIE
Proceedings, Fourteenth Conference on Great Lakes Research.
W72-13640 5C

The Decline of the Large Zooplankter, Limnocalanus Macrurus Sars (Copepoda: Calanoida), in Lake Erie,
W72-13643 5C

Chlorophyll a - Total Phosphorus Relationships in Lake Erie,
W72-13653 5C

Hypothesis for Dissolved Oxygen Depletion in the Central Basin Hypolimnion of Lake Erie,
W72-13659 5C

LAKE ERIE CENTRAL BASIN
Hypothesis for Dissolved Oxygen Depletion in the Central Basin Hypolimnion of Lake Erie,
W72-13659 5C

LAKE HURON
Proceedings, Fourteenth Conference on Great Lakes Research.
W72-13640 5C

LAKE LIVINGSTON
Nutrient Studies in Texas Impoundments,
W72-13692 5C

LAKE MARUIT
Tilapia Fishery in Lake Maruit: Age and Growth of Tilapia Nilotica L. In The Lake,
W72-14000 2H

LAKE MICHIE WATERSHED (NC)
Effects of Land Use on Municipal Watersheds,
W72-13759 4C

LAKE MICHIGAN
Proceedings, Fourteenth Conference on Great Lakes Research.
W72-13640 5C

Availability of Phosphorus for Cladophora Growth in Lake Michigan,
W72-13644 5C

Distribution of Chlorophyll and Its Relation to Particulate Organic Matter in the Offshore Waters of Lake Michigan,
W72-13648 5C

Phytoplankton Assemblage Differences at Inshore Versus Offshore Stations in Lake Michigan, and Their Effects on Nutrient Enrichment Experiments,
W72-13650 5C

Radioactivity in Lake Michigan Water and Biota Vicinity of Big Rock Point Nuclear Reactor, 1960-69,
W72-13656 5C

Radionuclide Concentrations Near the Big Rock Point Nuclear Power Station,
W72-13661 5C

Geologic Cross Sections Derived from Seismic Profiles and Sediment Cores from Southern Lake Michigan,
W72-13844 2J

LAKE MODELS
Functional Model of the Lake Ecological System (In Russian),
W72-14167 5C

LAKE ONTARIO
Proceedings, Fourteenth Conference on Great Lakes Research.
W72-13640 5C

Evidence for the Eutrophication of Lake Ontario from the Sedimentary Diatom Succession,
W72-13641 5C

Influences of Thermal Effluents Upon Aquatic Production in Lake Ontario,
W72-13642 5C

LAKE QUARUN
The Biology and Fishery of Mugil Saliens (Risso) in Lake Quarun, U. A. R.,
W72-14107 2H

LAKE SEDIMENTS
Electrodialysis: A Method for Extracting Available Nutrients in Great Lakes Sediments,
W72-13658 5C

LAKE ST. LOUIS (QUEBEC)
The Ichthyofauna and Flora of Lake St. Louis on the St. Lawrence River Near Montreal, Quebec: General Features and Recent Changes,
W72-13647 5C

LAKE SUPERIOR
Proceedings, Fourteenth Conference on Great Lakes Research.
W72-13640 5C

Diked Disposal Area Program, Duluth-Superior Harbor, St. Louis County, Minnesota and Douglas County, Wisconsin (Draft Environmental Impact Statement).
W72-13954 5G

LAKE TRAVIS
Nutrient Studies in Texas Impoundments,
W72-13692 5C

LAKE WACO (TEX)
U234/U238 Disequilibrium in Groundwaters of Central Texas,
W72-13971 5B

LAKE WINNEBAGO
Evaluation of Intensive Freshwater Drum (Aplodinotus Grunniens) Removal in Lake Winnebago, Wisconsin, 1955-1966,
W72-14109 2H

LAKES
W72-13655 5C

Comprehensive Abatement Program for an Eutrophic Lake,
W72-13663 5C

Limnological Studies of Big Bear Lake, California,
W72-13739 5C

Linmology of Oneida Lake with Emphasis on Factors Contributing to Algal Blooms,
W72-13851 5C

Life History and Ecology of the Gizzard Shad, Dorosoma Cepedianum (Le Sueur) With Reference to Elephant Butte Lake,
W72-13927 2H

Effect of Eddy Diffusivity on Wind-Driven Currents in a Two-layer Stratified Lake,
W72-14010 2H

Intraspecific Competition in Lake-Dwelling Triclads: A Laboratory Study,
W72-14132 2H

LAKESHORE DEVELOPMENT
Patterns of Lakeshore Usage Around Lake Bemidji,
W72-14131 5C

LAMINAR FLOW
A Turbulent Flow Theory of Electrodialysis,
W72-14061 3A

Control of Concentration Polarization in Reverse Osmosis Desalination of Water,
W72-14080 3A

LAND
Problems in the Heat and Water Regime of Agricultural Lands (Voprosy teplovogo i vodnogo rezhima sel'skokhozyaystvennykh poley).
W72-13858 3F

LAND DEVELOPMENT
Water Quality of Streams in the Neshaminy Creek Basin, Pennsylvania,
W72-13737 2K

LAND RECLAMATION
Origin of Saline Soils and Their Regime, Volume 2,
W72-14041 3C

LAND SUBSIDENCE
Prehistoric Near-Surface Subsidence Cracks in Western Freshno County, California,
W72-13717 2E

LAND USE
Effects of Land Use on Municipal Watersheds,
W72-13759 4C

Fish and Wildlife in the Marine and Coastal Zone, Part A, Summary Planning Information, and Recommendations,
W72-13908 6G

Effect of Land use Period on Soil Properties,
W72-13922 2G

LANDFILLS
Geological Considerations of Sanitary Landfill Site Evaluations,
W72-13719 5B

LANEPORT
Laneport, North Fork and South Fork Lakes, San Gabriel River, Texas (Draft Environmental Impact Statement).
W72-13956 8A

LARGEMOUTH BASS
Harvest and Feeding Habitats of Largemouth Bass (Micropterus Salmoides) in Murphy Flowage, Wisconsin,
W72-14114 8I

LASER RADIATION
Tunable Infrared Laser Spectroscopy of Atmospheric Water Vapor,
W72-13732 2B

LATVIA
Development of the Gauya River Valley (Razvitiye doliny reki Gauya),
W72-14034 2J

LAUNDERING
Phosphorus in Wastewater,
W72-14046 5B

LAW OF THE SEA
The 1973 Conference on the Law of the Sea in the Light of Current Trends in State Seabed Practice,
W72-13941 6E

LAWRENCE CREEK
Responses of a Brook Trout (Salvelinus Fontinalis) Population to Habitat Development in Lawrence Creek,
W72-14108 8I

LEACHING
Water and Some Nutrients Losses by Deep Percolation as Influenced by the Depth of Water Table,
W72-13923 2G

LEAD
Co-precipitation Applied in the Determination of Lead in Drinking Water, (In Serbo-Croatian),
W72-14179 5A

LEAD DIOXIDE ELECTRODE
Wax-Bound Lead Dioxide Potentiometric Electrode and Applications to Chelometric Titration,
W72-13676 5A

LEAD ELECTRODES
Titrimetric Determination of Trace Sulfur in Petroleum Using a Lead Ion Selective Electrode,
W72-13806 5A

LEASES
Program Statement for the Proposed Prototype Oil Shale Leasing Program (Draft Environmental Impact Statement).
W72-13969 3E

LEGAL ASPECTS
The Law and the Corporate Polluter: Flexibility and Adaption in the Developing Law of the Environment,
W72-13938 5G

Air Code and Water Quality Criteria for Interstate Streams for State of Arkansas.
W72-14044 6E

LEGAL REVIEW
Oil Pollution of the Marine Environment - A Legal Bibliography,
W72-13904 5G

Private Remedies to Abate Water Pollution in Virginia and New Theories in Environmental Law,
W72-13937 5G

LEGISLATION
Potable Waters.
W72-13940 5G

Powers and Duties of the Department of Environmental Resources, Its Officers and Departmental and Advisory Boards and Commissions.
W72-13948 6E

Water Bank Program (Draft Environmental Impact Statement).
W72-13959 6G

Air Code and Water Quality Criteria for Interstate Streams for State of Arkansas.
W72-14044 6E

LEMNA-M
Water Plant Communities in Eastern Lower Saxony (I and II), (In German),
W72-14117 5C

LEPOCINCLIS-TEXTA
Ecologic Study of Two Small Ponds in the Environs of Wevelgem (West Flanders),
W72-14187 5C

LEPOMIS-MACROCHIRUS
Use of Ultraviolet Light to Increase the Availablity of Aerial Insects to Caged Bluegill Sunfish,
W72-14140 2I

LETHAL LIMIT
W72-13864 5C

LETTUCE-D
Contamination of Lettuce Irrigated with Sewage Effluent,
W72-14104 5B

LEVEES
Dively Drainage and Levee District (District 23), Illinois (Draft Environmental Impact Statement).
W72-13955 8D

LIFE HISTORY STUDIES
Competition and Isolation Mechanisms in the Gambusia Affinis X G. Heterochir Hybrid Swarm,
W72-13718 8H

Life History and Ecology of the Gizzard Shad, Dorosoma Cepedianum (Le Sueur) With Reference to Elephant Butte Lake,
W72-13927 2H

LIGHT TRAP
A New Light Trap for Plankton,
W72-13797 5A

LILIUM-BULBIFERUM-M
Spread of the Orange Lily in the River Valleys of Lithuania,
W72-14168 2I

LIMESTONES
Digital Computer Modeling of Limestone Groundwater Systems,
W72-14001 2F

Carbonate Chemistry of Aquifer and Stream Water in Kentucky,
W72-14004 2F

LIMITING CURRENT DENSITY
A Turbulent Flow Theory of Electrodialysis,
W72-14061 3A

LIMNOCALANUS MACRURUS SARS
The Decline of the Large Zooplankter, Limnocalanus Macrurus Sars (Copepoda: Calanoida), in Lake Erie,
W72-13643 5C

LIMNOLOGY
Limnological Studies of Big Bear Lake, California,
W72-13739 5C

Linmology of Oneida Lake with Emphasis on Factors Contributing to Algal Blooms,
W72-13851 5C

LINDANE
Chlorinated Hydrocarbon, Microparticulate Effects on Microorganisms Isolated from Lake Erie,
W72-13999 5C

LINDATOX
The Effect of Certain Chlorinated Organic Pesticides on Hygienic Indicators of Water,
W72-14164 5C

LINEAR ALKYLATE SULFONATES
Biodegradation of Synthetic Detergents Evaluation by Community Trials: 1. Linear Alkylbenzene Sulfonates,
W72-13703 5D

LIPID QUALITY
Effect of Soil-Moisture Stress on the Lipid Quality of Matured Wheat Grains,
W72-14155 3F

LIQUID CHROMATOGRAPHY
An Automated Liquid Chromatographic Method for the Determination of Tetracycline Antibiotics,
W72-13669 5A

LIQUID FLOW PATTERN
Application of Inorganic Ion Exchange MEMBRANES TO Electrodialysis,
W72-14081 3A

LIQUID SOLID CHROMATOGRAPHY
Rapid Method for Detection and Characterization of Steroids,
W72-13781 5A

LIQUID WASTES
Liquid Treating Apparatus,
W72-13878 5D

Radiation Treatment of Materials,
W72-13883 5D

Fluid Separation,
W72-13890 5G

LIQUIDS
Measurements of Very Low Oxygen Tensions in Unstirred Liquids,
W72-13785 5A

LITHUANIA
Spread of the Orange Lily in the River Valleys of Lithuania,
W72-14168 2I

LITTLE RIVER INLET (NC)
Little River Inlet, North Carolina and South Carolina, Navigation Improvements (Draft Environmental Impact Statement).
W72-13964 4A

LIVEBEARERS
Competition and Isolation Mechanisms in the Gambusia Affinis X G. Heterochir Hybrid Swarm,
W72-13718 8H

LIZARDS
Analysis of the Environmental Factors in the Area of Distribution of Chalarodon Madagascariensis: Their Biological Implications,
W72-14144 2I

LOCUST HATCHLINGS
Effect of Soil Moisture on the Phase Characters of Hatchlings in the Desert Locust, Schistocerca Gregaria Forsk,
W72-14092 2I

LOGGING (RECORDING)
Records of Wells in Harris County, Texas, 1892-1972,
W72-14027 4B

LOISACH RIVER
Hydrogeological Studies in the Captation Area of the Loisach River Between Garmisch-Partenkirchen and Eschenlohe/OBB,
W72-14148 2E

LONG ISLAND
Study of Environmental Impacts of Alternative Long Island Sound Bridge Sites,
W72-13907 6G

LONG ISLAND (NY)
Experimental Injection of Tertiary-Treated Sewage in a Deep Well at Bay Park, Long Island, N. Y.--A Summary of Early Results,
W72-13839 5B

LORAIN HARBOR (OHIO)
Lorain Harbor, Ohio (Maintenance) (Draft Environmental Impact Statement).
W72-13962 4A

LOST CIRCULATION
Which Lost-Circulation Materials to Use ... And How to Use Them,
W72-13621 8G

Squeeze Slurries for Lost Circulation Control,
W72-13622 8G

A New Look at Lost Circulation,
W72-13623 8G

An Analysis and the Control of Lost Circulation,
W72-13627 8B

LOST CREEK DAM PROJECT (ORE)
Lost Creek Lake Project, Rogue River, Oregon (Draft Environmental Impact Statement).
W72-13965 8D

LOTA-LOTA-LOTA
Aspects of the Nutritive Dynamics and Trophic Relationships of the Burbot (Lota Lota Lota L.) in the Upper Mures River, (In Rumanian),
W72-14127 2H

LOUISIANA
Squeeze Slurries for Lost Circulation Control,
W72-13622 8G

The Genesis of Selected Hydrochemical Facies in Baton Rouge, Louisiana, Ground Waters,
W72-14008 2F

LYSIMETERS
Mechanical Balance: Electrical Readout Weighing Lysimeter,
W72-14185 7B

MACRORETICULAR RESINS
Macroreticular Resins-A Solution To Aggressive Conditions,
W72-13690 5D

MADAGASCAR
The Hydrological Conditions of Ambaro Bay (Northwestern Madagascar): Contribution to the Study of a Tropical Eutrophic Bay, (In French),
W72-14182 5C

MAINE
Chronology of a Kettle-Hole Peat Bog, Cherryfield, Maine,
W72-14019 2J

The Northern Maine Regional Treatment System, Aroostook River-Prestile Stream, A Plan for Clean Water, Summary Report.
W72-14049 5D

MAKABUSI RIVER (RHODESIA)
Notes on a Rhodesian Colony of the Red Bishop,
W72-14142 2I

MALAGOSY
Analysis of the Environmental Factors in the Area of Distribution of Chalarodon Madagascariensis: Their Biological Implications,
W72-14144 2I

MANAGEMENT
Radioactive Waste Management Practices in Western Europe.
W72-13983 5G

MANGANESE
The Concentrations of Cadmium, Copper, Iron, Manganese, Molybdenum, Nickel, Vanadium and Zinc in Part of the Tropical Northeast Atlantic Ocean,
W72-13985 5A

Chemical Factors that Influence the Availability of Iron and Manganese in Aqueous Systems,
W72-14022 5B

MAPS
Permafrost in Canada.
W72-13831 7C

MARINE BIOLOGY
Preliminary Report on Techniques for Marine Monitoring Systems,
W72-13850 5B

MARSH SOILS
The Main Physico-Chemical Characteristics of Soils of the Vertisal and Sodium-Containing Type in the Rochefort Marsh at St-Laurent-De-La-Pree (Maritime Charente, France),
W72-14190 2G

MARYLAND
Ground-Water Occurrence in the Maryland Piedmont,
W72-13848 2F

MARYLAND (PIEDMONT PROVINCE)
Ground-Water Occurrence in the Maryland Piedmont,
W72-13848 2F

MASS SPECTROMETRY
On-Line Computer-Controlled Electrical Detection in Spark Source Mass Spectrometry,
W72-13770 7B

An Artifact in the Gas Chromatographic Determination of Impurities in Pentachlorophenol,
W72-13774 5A

Rapid Method for Detection and Characterization of Steroids,
W72-13781 5A

The Analysis of Trace Organics in Fresh Water by Gas Chromatography -- Mass Spectroscopy,
W72-14057 5A

MASS SPECTROPHOTOMETRY
An Experimental Study of the Structure, Thermodynamics and Kinetic Behavior of Water,
W72-14060 1B

MASS TRANSFER METHOD
Disposal of Brine by Solar Evaporation,
W72-14077 2D

MASS WASTING
Growth of a Talus Cone in the Western Chugach Mountains, Alaska,
W72-14026 2J

MATHEMATICAL MODEL
Oxygen Uptake and Mechanism of Substrate Purification in a Model Trickling Filter,
W72-13697 5D

MATHEMATICAL MODELS
Hypertrophic Growth,
W72-13668 5C

Process Modeling of Biological Waste Treatment,
W72-13694 5D

A Statistical Analysis of Base-Flow Flood Discharge Data,
W72-13700 2E

Theory of Stochastic Modeling of Watershed Systems,
W72-14007 2A

Redistribution of Soil Water After Infiltration,
W72-14197 2G

MATHEMATICAL STUDIES
On Calculation of the Areas of Off-Chart Chromatographic Peaks Using Data Obtained with the Aid of Integrators,
W72-13769 7B

Nonsteady Flow in a Recharge Well-Unconfined Aquifer System,
W72-13828 2F

Ground-Water Outflow from Chino Basin, Upper Santa Ana Valley, Southern California,
W72-13838 2F

MCLEAN COUNTY (N. DAK)
Ground-Water Resources of McLean County, West-Central North Dakota,
W72-13716 7C

MEANDERS
Alluvial Cutoff Dating from Subsequent Growth of a Meander,
W72-14025 2J

MEASUREMENT
Size Distribution of Bacterial Cells,
W72-13667 5A

Wax-Bound Lead Dioxide Potentiometric Electrode and Applications to Chelometric Titration,
W72-13676 5A

Measurements of Very Low Oxygen Tensions in Unstirred Liquids,
W72-13785 5A

Problems in Hydrologic Instrumentation (Voprosy gidrologicheskogo priborostroyeniya).
W72-13859 7B

Apparatus for Measuring Properties of a Fluid Body from an Airborne Vehicle,
W72-13876 7B

Environmental Radioactivity at the National Nuclear Research Centre, Pelendaba. Report for the year 1970.
W72-13984 5B

Radiation Data, (Section II - Water).
W72-13988 5A

Radiation Data, (Section II - Water).
W72-13989 5A

A Device for Measuring and Recording the Amount and Duration of Free Water on Vegetation in the Field,
W72-14094 3F

Improved Thermocouple Psychrometer for the Measurement of Plant and Soil Water Potential: II. Operation and Calibration,
W72-14120 7B

An Improved Soil Water Flux Sensor,
W72-14192 7B

MECHANICAL BALANCE
Mechanical Balance: Electrical Readout Weighing Lysimeter,
W72-14185 7B

MECHANICAL CONTROL
Declaring War....On Mesquite,
W72-13925 3B

MEDITERRANEAN SEA
Concentrations and Distributions of Long-Lived Fallout Radionuclides in Open Ocean Sediments,
W72-13980 5B

MEMBRANE DIALYSIS
Effect of pH on the Filtration of Aquatic Humus Using Gels and Membranes,
W72-13681 5A

MEMBRANE FILTERS
A Quantitative Comparison of Pigment Extraction by Membrane and Glass-Fiber Filters,
W72-13673 5A

MEMBRANE FOULING
Influence of Strongly Bound Counter-Ions on Permselective Membranes,
W72-14073 3A

MEMBRANE POISONING
Influence of Strongly Bound Counter-Ions on Permselective Membranes,
W72-14073 3A

MEMBRANE PROCESSES
Reverse Osmosis Membrane Module (Spiral-Wound Concept),
W72-14069 3A

Water Transport in Hyperfiltration Membranes,
W72-14072 3A

Drying Cellulose Acetate Reverse Osmosis Membranes,
W72-14078 3A

Control of Concentration Polarization in Reverse Osmosis Desalination of Water,
W72-14080 3A

MEMBRANE-SOLUTION IINTERFACES
Study of Membrane-Solution Interfaces by Electro-Chemical Methods,
W72-14075 3A

MEMBRANE STERILIZATION
Biological Degradation of Cellulose Acetate Reverse Osmosis Membranes,
W72-14079 3A

MEMBRANES
Reverse Osmosis System,
W72-13879 3A

Desalination Apparatus and Process of Manufacture Using Improved, Acid Grafted Nitrogenous Membranes,
W72-13886 3A

Process for Treating Water with a Polyhalide Resin Using a Semipermeable Membrane Barrier,
W72-13887 5F

Water Transport in Hyperfiltration Membranes,
W72-14072 3A

Influence of Strongly Bound Counter-Ions on Permselective Membranes,
W72-14073 3A

Operation of Reverse Osmosis Pilot Plants,
W72-14074 3A

Study of Membrane-Solution Interfaces by Electro-Chemical Methods,
W72-14075 3A

Study of Poly (Methacrylates) and Poly (Urethanes) As Reverse Osmosis Membranes. Effect of Water Clustering on Transport Properties,
W72-14076 3A

Drying Cellulose Acetate Reverse Osmosis Membranes,
W72-14078 3A

Biological Degradation of Cellulose Acetate Reverse Osmosis Membranes,
W72-14079 3A

MEMBRANES

Application of Inorganic Ion Exchange MEMBRANES TO Electrodialysis,
W72-14081 3A

Transport Processes in Hyperfiltration Membranes I,
W72-14083 3A

Research on Ion Transport Across Microbial Membranes,
W72-14084 3A

Continuing Development of a General Mechanistic Theory of Membrane Phenomena and Continuing Experimental and Theoretical Studies of Ion-Exchange Polarization Phenomena,
W72-14085 3A

Transport Property Requirements of Membranes for Use in Pressure Dialysis Desalination,
W72-14088 3A

MERCURY

Observations on the Mercury Content of Myoxocephalus Quadricornis (L.) (Teleostei, Cottidae) in Finland,
W72-13695 5B

Chronic Exposure of Rats to Methyl Mercury in Fish Protein,
W72-13780 5C

Method for Determination of Mercury in Biological Materials by Neutron Activation Analysis,
W72-13788 5A

Emission Spectrometric Determination of Trace Amounts of Mercury,
W72-13790 5A

Simple Device for Compensation of Broad-Band Absorption Interference in Flameless Atomic Absorption Determination of Mercury,
W72-13803 5A

2-Amino-4-Methylthiazole as a Reagent for the Gravimetric Determination and Extraction of Mercury (II),
W72-13812 5A

Pesticide and Mercury Levels in Migrating Duck Populations,
W72-13865 5C

Concentration of Mercury in the Manufacture of Fish Protein Concentrate by Isopropyl Alcohol Extraction of Sheepshead and Carp,
W72-13869 5C

Sorption-Desorption Reactions of Mercury with Suspended Matter in the Columbia River,
W72-13972 5B

METABOLISM

Metabolism of Polychlorinated Norbornenes by Clostridium butyricum,
W72-13779 5B

The Elements of Energy Balance in Grass Carp (CtenopharyngodonIdella Val.): I,
W72-13815 2I

Effects of Temperature on the Respiratory Metabolism of Three Chesapeake Bay Bivalves,
W72-13997 5C

METABOLITES

Thin-Layer Chromatographic-Enzymatic Identification of Some Lindane- and Possible DDT-Metabolites as well as Pentachlorophenol, (Dunnschichtchromatographisch-Enzymatischer Nachweis Einiger Lindan-Und Theoretisch Moglicher DDT-Metaboliten Sowie Von Pentachlorphenol),
W72-13760 5A

METALS

Platinum Minerals in Quaternary Sediments Between the Anabar and Olenek Rivers (Platinovyye mineraly chetvertichnykh otlozheniy Anabaro-Olenekskogo mezhdurech'ya),
W72-14035 2J

METEORIC WATER

Tunable Infrared Laser Spectroscopy of Atmospheric Water Vapor,
W72-13732 2B

METEOROLOGICAL DATA

Four-Dimensional World-Wide Atmospheric Models (Surface to 25 Km Altitude),
W72-13843 2B

METEOROLOGY

Use of Zaytsev Method for Determining the Water Content of Fogs in Chambers,
W72-13863 7B

METERS. *NEUTRON MOISTURE METERS

A Hand-Augering Method of Installing Access Tubing for Neutron Moisture Meters,
W72-14194 7B

METHIONINE

Synchronization of Cell Division in Escherichia Coli by Elevated Temperatures: A Reinterpretation,
W72-13666 5C

METHOD OF MAXIMUM LIKELIHOOD

A Statistical Analysis of Base-Flow Flood Discharge Data,
W72-13700 2E

METHODOLOGY

Size Distribution of Bacterial Cells,
W72-13667 5A

Evaluation of Methods for Detection of Coliform Bacteria in Raw Milk,
W72-13671 5A

A Technique for Curie Point Pyrolysis Gas Chromatography of Complex Biological Samples,
W72-13761 5A

On-Line Computer-Controlled Electrical Detection in Spark Source Mass Spectrometry,
W72-13770 7B

Gas Liquid Chromatographic Analysis of Hydrocarbon Mixtures. A Report on the Work of the International Conference of Benzole Producers,
W72-13771 5A

METHYL MERCURY

Chronic Exposure of Rats to Methyl Mercury in Fish Protein,
W72-13780 5C

MEUSE RIVER

The Fish Fauna of the Estuarine Area of the Rhine and Meuse Rivers,
W72-14153 5B

MEXICO

Controlled-Environment Vegetable Production: Results of Trials at Puerto Penasco, Mexico, 1968-1970,
W72-13926 3F

MIAMI RIVER BASIN

A Multilevel Approach to Determining Optimal Taxation for the Abatement of Water Pollution,
W72-13935 5G

MICHIGAN

Sprinkler Irrigation System Solves Waste Water Problems.
W72-13691 5D

MICROBIAL MEMBRANES

Research on Ion Transport Across Microbial Membranes,
W72-14084 3A

MICROCRACKS

Microcracking Effect on Flexural Strength of Concrete After Repeated Loading,
W72-13744 8F

MICROORGANISMS

Cellulolytic Activity in Municipal Solid Waste Composting,
W72-13686 5B

The Present Status and Future Prospect of the Turbidostat,
W72-13772 5A

Variation in the Toxicity of Arsenic Compounds to Microorganisms and the Suppression of the Inhibitory Effects by Phosphate,
W72-13813 5C

The Biodegradation of Organic Substrates Under Arctic and Subarctic Conditions,
W72-13822 5C

Process for Treating Water with a Polyhalide Resin Using a Semipermeable Membrane Barrier,
W72-13887 5F

Method and Apparatus for Use in the Activated Sludge Treatment of Sewage,
W72-13901 5D

MILK

Evaluation of Methods for Detection of Coliform Bacteria in Raw Milk,
W72-13671 5A

Growth of Salmonella Typhimurium in Skim Milk Concentrates,
W72-13818 5A

Arazate Method for Estimating Copper in Water,
W72-14191 5A

MILWAUKEE (WIS.)

PCBs in Fish from the Milwaukee Region,
W72-13652 5C

MINERAL PARTICULATES

Effect of Mineral Particulates on Microbial Degradation of Solid Organic Materials,
W72-13645 5C

MINERALOGY

Inverse Relation Between Foreshore Slope and Mean Grain Size as a Function of the Heavy Mineral Content,
W72-14016 2J

Platinum Minerals in Quaternary Sediments Between the Anabar and Olenek Rivers (Platinovyye mineraly chetvertichnykh otlozheniy Anabaro-Olenekskogo mezhdurech'ya),
W72-14035 2J

MINERALS
Determination of the Reserve of Available Phosphates in Irrigated Soils (In Russian),
W72-14169 5B

Problems of Interaction of Mineral Fertilizers and Irrigation on Certain Types of Hungarian Soils, (In Russian),
W72-14172 3F

MISSOURI
A Distributional Study of Missouri Fishes,
W72-13910 2I

Water Law--Groundwater Rights in Missouri--A Need for Clarification (Higday V. Nickolaus),
W72-13939 6E

Groundwater Resources of Saline County, Missouri,
W72-14011 2F

MISTLETOE-D
Lodgepole Pine-Dwarf Mistletoe Xylem Water Potentials,
W72-14119 2I

MIXING
Process Modeling of Biological Waste Treatment,
W72-13694 5D

MIXTURES
Gas Liquid Chromatographic Analysis of Hydrocarbon Mixtures. A Report on the Work of the International Conference of Benzole Producers,
W72-13771 5A

MODEL STUDIES
W72-13655 5C

Application of Models in Geohydrological Investigations,
W72-13731 2A

Roughness Elements as Energy Dissipators of Free-Surface Flow in Circular Pipes,
W72-13747 8B

Evaluation of a Deterministic Model for Predicting Water Yields from Small Agricultural Watersheds in Virginia,
W72-13824 2A

Future Water Use Model of Utah Valley,
W72-13928 4A

Model Studies of Outfall Systems for Desalination Plants (Part II - Estuary Models),
W72-14064 5B

MOISTURE
Inorganic Phosphate Fractions in Calcareous Soils in Relation to Moisture and Incubation Period,
W72-14189 2G

MOISTURE METERS
A Radiation Mole Flow-Moisture Meter,
W72-13862 7B

MOISTURE STATUS
Studies of Moisture Status and Storage Conditions of Spring-Lifted, Mud-Packed Douglas-Fir Seedlings,
W72-14100 2I

MOISTURE STRESS
Moisture Stress and Stem Diameter in Young Douglas-Fir,
W72-14098 2I

Effect of Moisture Stress and Indolebutyric Acid on Rooting of Stem Cuttings of Pomegranate (Punica Granatum L.),
W72-14123 3F

MOLDAVIA
Hydrologic Investigations, Computations, and Forecasts (Voprosy gidrologicheskikh issledovaniy, raschetov i prognozov).
W72-13854 4A

Formation, Calculation, and Regulation of Streamflow (Formirovaniye, raschety i regulirovaniye rechnogo stoka).
W72-13857 4A

MOLECULAR STRUCTURE
A Computerized System for Storing, Retrieving, and Correlating NMR Data,
W72-13808 7C

MONITORING
Preliminary Report on Techniques for Marine Monitoring Systems,
W72-13850 5B

Environmental Radioactivity at the National Nuclear Research Centre, Pelendaba. Report for the year 1970.
W72-13984 5B

Hanford Atomic Products Operation, January-December 1969.
W72-13991 5B

A Review of Pesticide Monitoring Programs in California.
W72-14043 7B

MONITORING TECHNIQUES
Preliminary Report on Techniques for Marine Monitoring Systems,
W72-13850 5B

MONO LAKE (CALIF)
Rapid Method for Detection and Characterization of Steroids,
W72-13781 5A

MONTEREY BAY
DDT Residues in Eight California Marine Fishes,
W72-13946 5B

MONTEREY BAY (CALIF)
A Study of Light Attenuation in Monterey Bay, California,
W72-13798 5A

MONTMORILLONITE
Amide-Water Interaction on Montmorillonite Surface,
W72-13916 2G

MORRO BAY AREA (CALIF)
Sea Water Intrusion: Morro Bay Area, San Luis Obispo County,
W72-13846 2L

MORTALITY
Mortality of Pacific Oysters (Crassotrea GIGas): The Influence of Temperature and Enriched Seawater on Oyster Survival,
W72-13875 5C

MOSQUITOES
Eggs of Floodwater Mosquitoes: XIV. Northern Aedes (Diptera: Culicidae),
W72-14115 2I

MUD LOSSES
A New Look at Lost Circulation,
W72-13623 8G

MUGIL-SALIENS
The Biology and Fishery of Mugil Saliens (Risso) in Lake Quarun, U. A. R.,
W72-14107 2H

MULTIPHASE FLOW
Perturbation Analysis of Two-Phase Infiltration,
W72-14006 2G

MULTIPLE-PURPOSE PROJECTS
Salt River Project 1971 Annual Report.
W72-13913 4A

Lost Creek Lake Project, Rogue River, Oregon (Draft Environmental Impact Statement).
W72-13965 8D

MULTIPLE-PURPOSE RESERVOIRS
Salt River Project 1971 Annual Report.
W72-13913 4A

MUNICIPAL WASTES
Cellulolytic Activity in Municipal Solid Waste Composting,
W72-13686 5B

Higher BOD Removal Via Chemical Additives.
W72-13689 5D

Proceedings of the Land Spreading Conference at Orlando, Florida on July 15, 1971.
W72-13704 5D

MUNICIPAL WATER
The River Basin Model: Chairman and Council.
W72-13930 6A

MURES RIVER
Aspects of the Nutritive Dynamics and Trophic Relationships of the Burbot (Lota Lota Lota L.) in the Upper Mures River, (In Rumanian),
W72-14127 2H

MUSKELLUNGE
Growth of Known Age Muskellunge (Esox Masquinongy) in Wisconsin and Validation of Age and Growth Determination Methods,
W72-14110 2I

MUSKMELON-D
Sprinkle, Furrow and Trickle Irrigation of Muskmelon in an Arid Zone,
W72-14090 3F

MUSSELS
Mussels and Barnacles as Indicators of the Variation of Manganese-54, Cobalt-60 and Zinc-65 in the Marine Environment,
W72-13978 5B

MYTILUS CALIFORNIANUS
Mussels and Barnacles as Indicators of the Variation of Manganese-54, Cobalt-60 and Zinc-65 in the Marine Environment,
W72-13978 5B

NATIONAL RIGHTS
Oil Pollution of the Marine Environment - A Legal Bibliography,
W72-13904 5G

NATURAL GAS
Investigations of Organic Matter in Groundwater of Oil- and Gas-Bearing Regions (Metodicheskiye issledovaniya v oblasti izucheniya organicheskogo veshchestva podzemnykh vod neftegazonosnykh oblastey),
W72-13856 5B

NATURAL RESOURCES
Natural Resources and Recreation Agencies, 1971 Annual Report.
W72-13945 6E

NAVIGATION
Little River Inlet, North Carolina and South Carolina, Navigation Improvements (Draft Environmental Impact Statement).
W72-13964 4A

NEBRASKA
Winnebago-Bean Creek Watershed, Richardson County, Nebraska (Draft Environmental Impact Statement).
W72-13951 4D

Winnebago-Bean Creek Watershed, Nebraska (Final Environmental Impact Statement).
W72-13966 4D

NEGATIVE SALT REJECTION
Transport Processes in Hyperfiltration Membranes I,
W72-14083 3A

NESHAMINY CREEK BASIN (PENN)
Water Quality of Streams in the Neshaminy Creek Basin, Pennsylvania,
W72-13737 2K

NESTING
Study of Environmental Impacts of Alternative Long Island Sound Bridge Sites,
W72-13907 6G

NETHERLANDS
Review of Geohydrological Activities in the Netherlands Since World War II, In Particular of the Government Institute for Water Supply,
W72-13721 2F

Geohydrological Investigations with a View to Groundwater Catchment--A Case History,
W72-13723 4B

The Use of Geohydrology in Solving Water Management Problems in Agriculture,
W72-13726 4B

Recent Developments of Physical Investigations in Boreholes and Wells,
W72-13727 4B

NEUTRON ACTIVATION ANALYSIS
Method for Determination of Mercury in Biological Materials by Neutron Activation Analysis,
W72-13788 5A

Neutron-Activation Determination of Vanadium in Oils and Catalysts,
W72-13804 5A

NEUTRON MOISTURE GAGE
Water Profile Fluctuations Recorded Beneath Some Forage Plants During the Dry Season Using the Neutron Method, (In French),
W72-14138 7B

NEUTRON SCATTERING
A Neutron Scattering Study of the Kinetics of Diffusion and the Relation to the Structures of Ionic Solutions,
W72-14067 1B

NEVA RIVER
Hydrologic Computations and Forecasts (Voprosy gidrologicheskikh raschetov i prognozov).
W72-14038 4A

NEVADA
Streamflow Synthesis -- A Case Study,
W72-14005 2A

Nonantecedent Development of Truckee River Canyon, Northern Carson Range, Nevada and California,
W72-14015 2J

The Effects of Increasing Salinity on the Pyramid Lake Fishery,
W72-14054 5C

NEW CASTLE COUNTY (DEL)
Nitrate Contamination of the Water-Table Aquifer in Delaware,
W72-13834 5B

NEW GUINEA
Morphometric Analysis of Polygonal Karst in New Guinea,
W72-14018 2J

NEW JERSEY
Annual Report, Fiscal Year 1970-1971.
W72-13821 9D

NEW MEXICO
Requirements for Approval of Individual Sewage Disposal Systems.
W72-13943 5G

An Integration of the Agricultural Demand Function for Water and the Hydrologic Model of the Pecos Basin,
W72-13993 6D

Potentials for Desalting Water in the Tularosa Basin, New Mexico - A Case Study,
W72-14059 3A

NEW YORK
Surface Water Supply of the United States, 1961-65, Part 1. North Atlantic Slope Basins--Volume 2. Basins from New York to Delaware.
W72-13827 7C

Experimental Injection of Tertiary-Treated Sewage in a Deep Well at Bay Park, Long Island, N. Y.--A Summary of Early Results,
W72-13839 5B

Linmology of Oneida Lake with Emphasis on Factors Contributing to Algal Blooms,
W72-13851 5C

Study of Environmental Impacts of Alternative Long Island Sound Bridge Sites,
W72-13907 6G

Aquatic Plant Control Program, Hudson and Mohawk Rivers, New York (Final Environmental Impact Statement).
W72-13967 4A

Phosphorus in Wastewater,
W72-14046 5B

NEWPORT BEACH
Operation of Reverse Osmosis Pilot Plants,
W72-14074 3A

NICKEL
Nickel Pollution,
W72-13778 5A

The Concentrations of Cadmium, Copper, Iron, Manganese, Molybdenum, Nickel, Vanadium and Zinc in Part of the Tropical Northeast Atlantic Ocean,
W72-13985 5A

NILE DELTA
Effect of Land use Period on Soil Properties,
W72-13922 2G

NIOBIUM
Solvent Extraction and Separation of Zirconium, Niobium and Tantalum by 2-Carbethoxy-5-Hydroxy-1- (4-Tolyl)-4-Pyridone,
W72-13807 5A

NITRATES
Nitrate Contamination of the Water-Table Aquifer in Delaware,
W72-13834 5B

NITRIFICATION
Statistical Studies on the Relation Between Nitrification and Soil Temperature and Soil Moisture,
W72-14200 2G

NITRILOTRIACETATE
W72-13655 5C

NITROGEN
Variation of Precision with Time for Autoanalyzer Data,
W72-13763 7B

Biological Denitrification Using Fluidized Granular Beds,
W72-14047 5D

Cell Size in Russet Burbank Potato Tubers With Various Levels of Nitrogen and Soil Moisture Tensions,
W72-14124 3F

Reaction of Soil Fungi and Other Microorganisms to Various Levels of Nitrogen Fertilization and Irrigation of Cocksfoot (Dactylis Glomerata L.). (In Polish),
W72-14158 5C

NITROGEN DIOXIDE
On Nitrogen Forms in Dew or Frost Water: II. On the Changes of Nitrogen Dioxide in the Air, (In Japanese),
W72-14186 5B

NITROGEN FIXATION
Nutrient Studies in Texas Impoundments,
W72-13692 5C

NITROGENOUS MEMBRANES
Desalination Apparatus and Process of Manufacture Using Improved, Acid Grafted Nitrogenous Membranes,
W72-13886 3A

NOBLE FIR
The Kinetics of Water Absorption in Stratifying and Nonstratifying Noble Fir (Abies Procera Rehd.) Seeds,
W72-14099 2I

NONCHERNOZEM SOILS
Improvement of Soils By Cultivation in the Non-Chernozem Zone, (In Russian).
W72-14180 3F

NONLINEAR PROGRAMMING
Extensions of Mathematical Programming for Regional Water Quality Management,
W72-13931 5G

NORTH ATLANTIC SLOPE BASINS (NY TO DEL)
Surface Water Supply of the United States, 1961-65, Part 1. North Atlantic Slope Basins--Volume 2. Basins from New York to Delaware.
W72-13827 7C

NORTH CAROLINA
Esturine Ecosystems and High Temperatures,
W72-13636 5C

Effects of Land Use on Municipal Watersheds,
W72-13759 4C

Proposed Reclassifications of Certain Waters in the Broad, Catawba, French Broad, Hiwassee, Little Tennessee, New, and Watauga River Basins to be Considered at a Public Hearing to be Held on June 29, 1972, in Hickory, North Carolina.
W72-13942 5G

Little River Inlet, North Carolina and South Carolina, Navigation Improvements (Draft Environmental Impact Statement).
W72-13964 4A

NORTH DAKOTA
Ground-Water Resources of McLean County, West-Central North Dakota,
W72-13716 7C

NORTH SEA
Seasonal Variation of the Suspended Solid Matter, Off the Coast of North Yorkshire,
W72-13682 5B

NOTADEN-BENNETTI
Studies on Anuran Water Balance: II. Desiccation in the Australian Frog, Notaden Bennetti,
W72-14133 2I

NUCLEAR EXPLOSIONS
On The Physico-Chemical Behavior of Radioactive Cerium in Sea Water,
W72-13970 5B

Mussels and Barnacles as Indicators of the Variation of Manganese-54, Cobalt-60 and Zinc-65 in the Marine Environment,
W72-13978 5B

The Geochemistry of Radiocarbon in the Gulf of Mexico,
W72-13981 5B

NUCLEAR MAGNETIC RESONANCE
A Computerized System for Storing, Retrieving, and Correlating NMR Data,
W72-13808 7C

NUCLEAR POWERPLANTS
Radionuclide Concentrations Near the Big Rock Point Nuclear Power Station,
W72-13661 5C

Transport and Depletion of Radionuclides in the Columbia River,
W72-13975 5B

Mussels and Barnacles as Indicators of the Variation of Manganese-54, Cobalt-60 and Zinc-65 in the Marine Environment,
W72-13978 5B

Concentrations of Zinc-65 in Marine Foodstuffs and Pacific Coastal Residents,
W72-13979 5B

Radioactive Waste Management Practices in Western Europe.
W72-13983 5G

Environmental Radioactivity at the National Nuclear Research Centre, Pelendaba. Report for the year 1970.
W72-13984 5B

Permissible Activity Discharge into Receiving Waters Through Radioactive Waste Water from Nuclear Power Plants (Zulassige Aktivitatseinleitung in Vorfluter durch radioaktive Abwasser aus Kernkraftwerken),
W72-13987 5A

Hanford Atomic Products Operation, January-December 1969.
W72-13991 5B

Design and Siting Criteria for Once-Through Cooling Systems Based on a First-Order Thermal Plume Model,
W72-14030 5C

NUCLEAR WASTES
Radioactive Waste Management Practices in Western Europe.
W72-13983 5G

NUISANCE ALGAE
Comparative Effects of Aquatic Biotoxins on Cardiac Systems,
W72-14056 5C

NUISANCE (LEGAL ASPECTS)
Private Remedies to Abate Water Pollution in Virginia and New Theories in Environmental Law,
W72-13937 5G

NUTRIENT AVAILABILITY
Chemical Factors that Influence the Availability of Iron and Manganese in Aqueous Systems,
W72-14022 5B

NUTRIENT ENRICHMENT
Mortality of Pacific Oysters (Crassotrea GIGas): The Influence of Temperature and Enriched Seawater on Oyster Survival,
W72-13875 5C

NUTRIENT REMOVAL
Biological Denitrification Using Fluidized Granular Beds,
W72-14047 5D

NUTRIENT REQUIREMENTS
Changes in Plankton Species Composition and Diversity in a Controlled Nutrient Enrichment Study,
W72-13816 5C

NUTRIENTS
Nutrients, Phytoplankton Productivity and Species Composition as Influenced by Upwelling in Lake Michigan,
W72-13649 5C

Phytoplankton Assemblage Differences at Inshore Versus Offshore Stations in Lake Michigan, and Their Effects on Nutrient Enrichment Experiments,
W72-13650 5C

Electrodialysis: A Method for Extracting Available Nutrients in Great Lakes Sediments,
W72-13658 5C

A Case of Nutrient Enrichment in an Inshore Area of Georgian Bay,
W72-13662 5C

Nutrient Studies in Texas Impoundments,
W72-13692 5C

The River Wear: Inorganic Chemistry Relevant to a Biologist,
W72-13866 2K

Water and Some Nutrients Losses by Deep Percolation as Influenced by the Depth of Water Table,
W72-13923 2G

Chemical Factors that Influence the Availability of Iron and Manganese in Aqueous Systems,
W72-14022 5B

NYMPHS
Drought Resistance in Subalpine Nymphs of Somatochlora Semicircularis Solys (Odonata: Corduliidae),
W72-14183 2I

OASES
Origin of Saline Soils and Their Regime, Volume 2,
W72-14041 3C

OASIS AGRICULTURE
Origin of Saline Soils and Their Regime, Volume 2,
W72-14041 3C

OBSERVATION WELLS
Test-Observation Well Near Davenport, Washington: Description and Preliminary Results,
W72-13733 4B

OCEANS
Concentrations and Distributions of Long-Lived Fallout Radionuclides in Open Ocean Sediments,
W72-13980 5B

ODONATA
Additions to the List of Odonata of the Dutch Wadden Islands, with an Account of Water Quality Data of Larval Habitats, and a Review of the Dragonfly Fauna of the Dutch and German Northsea Islands,
W72-14162 2I

OGALLALA FORMATION
Economic Efficiency in the Allocation of Irrigation Water Over Time,
W72-13823 6B

OHIO
A Quantitative Comparison of Pigment Extraction by Membrane and Glass-Fiber Filters,
W72-13673 5A

Sandusky Harbor, Erie County, Ohio (Draft Environmental Impact Statement).
W72-13950 5G

Fairport Harbor, Lake County, Ohio (Draft Environmental Impact Statement).
W72-13961 4A

Lorain Harbor, Ohio (Maintenance) (Draft Environmental Impact Statement).
W72-13962 4A

OIL
Neutron-Activation Determination of Vanadium in Oils and Catalysts,
W72-13804 5A

Microdetermination of Carbon, Hydrogen, Nitrogen and Oxygen in Petroleum Compounds with an Automatic Elemental Analyzer,
W72-13805 5A

Investigations of Organic Matter in Groundwater of Oil- and Gas-Bearing Regions (Metodicheskiye issledovaniya v oblasti izucheniya organicheskogo veshchestva podzemnykh vod neftegazonosnykh oblastey),
W72-13856 5B

OIL FIELDS
Growth of Endomycopsis Lipolytica on Hydrocarbons,
W72-13817 5A

OIL FIRES
Oil Pollution Control and Fire Extinguishing Apparatus and Method,
W72-13884 5G

OIL POLLUTION
Investigation of Sinking Methods for Removal of Oil Pollution from Water Surfaces. Phase II. Methods of Test for Laboratory Evaluation of Oil Sinking Materials,
W72-13702 5G

Oil Pollution Control and Fire Extinguishing Apparatus and Method,
W72-13884 5G

Extracting Oil Waste,
W72-13888 5D

Fluid Separation,
W72-13890 5G

Oil Skimming Apparatus,
W72-13894 5G

Oil Pollution of the Marine Environment - A Legal Bibliography,
W72-13904 5G

Oil and the Ecology of the Arctic,
W72-14188 5C

OIL SHALES
Program Statement for the Proposed Prototype Oil Shale Leasing Program (Draft Environmental Impact Statement).
W72-13969 3E

OIL SKIMMERS
Floating Flexible Skimming Devices,
W72-13891 5G

Oil Skimming Apparatus,
W72-13894 5G

OIL SPILLS
Investigation of Sinking Methods for Removal of Oil Pollution from Water Surfaces. Phase II. Methods of Test for Laboratory Evaluation of Oil Sinking Materials,
W72-13702 5G

Oil Pollution: Persistence and Degradation of Spilled Fuel Oil,
W72-13810 5B

Floating Flexible Skimming Devices,
W72-13891 5G

Oil Skimming Apparatus,
W72-13894 5G

The Biodegradation of Oil in Seawater for Naval Pollution Control,
W72-14012 5B

OIL STRATA
Effect of Pumping Freshwaters Into Oil Strata of the Perm Prikamje on the Distribution of Microflora, (In Russian),
W72-14135 5C

OIL WASTES
Investigation of Sinking Methods for Removal of Oil Pollution from Water Surfaces. Phase II. Methods of Test for Laboratory Evaluation of Oil Sinking Materials,
W72-13702 5G

A Review of the Methods for the Identification of Persistent Hydrocarbon Pollutants on Seas and Beaches,
W72-13766 5A

Extracting Oil Waste,
W72-13888 5D

OIL WELLS
Oil Pollution Control and Fire Extinguishing Apparatus and Method,
W72-13884 5G

ON-SITE DATA COLLECTION
A Device for Collecting In-Situ Samples of Suspended Sediment for Microscopic Analysis,
W72-13693 5A

ON-SITE DATA COLLECTIONS
Indiana Water Quality, 1969, Monitor Station Records--Rivers and Streams.
W72-14045 7B

ON-SITE INVESTIGATIONS
Engineering Design Criteria for Spray Irrigation,
W72-13709 5D

Actual Spray Field Operations,
W72-13710 5D

ON-SITE TESTS
A Study of Light Attenuation in Monterey Bay, California,
W72-13798 5A

ONEIDA LAKE (NY)
Limnology of Oneida Lake with Emphasis on Factors Contributing to Algal Blooms,
W72-13851 5C

ONONDAGA LAKE (NEW YORK)
Comprehensive Abatement Program for an Eutrophic Lake,
W72-13663 5C

OPERATING COSTS
V.T.E. Desalting Plant, St. Croix, U.S. Virgin Islands Analysis of Operational Data,
W72-14058 3A

Hydraulic Design Optimization of the Electrodialysis Process,
W72-14082 3A

OPERATING EXPERIENCE
V.T.E. Desalting Plant, St. Croix, U.S. Virgin Islands Analysis of Operational Data,
W72-14058 3A

OPERATIONS
Responsibility for Plant Operations,
W72-13742 5F

OPTIMUM DEVELOPMENT PLANS
Extensions of Mathematical Programming for Regional Water Quality Management,
W72-13931 5G

ORANGE LILY
Spread of the Orange Lily in the River Valleys of Lithuania,
W72-14168 2I

OREGON
Lost Creek Lake Project, Rogue River, Oregon (Draft Environmental Impact Statement).
W72-13965 8D

ORGANIC ACIDS
The Analysis of Trace Organics in Fresh Water by Gas Chromatography -- Mass Spectroscopy,
W72-14057 5A

ORGANIC COMPOUNDS
New Methods for Detection and Quantification in Thin-Layer Chromatography: A Study of Pyrolysis and Combustion Systems,
W72-13768 5A

Gas Liquid Chromatographic Analysis of Hydrocarbon Mixtures. A Report on the Work of the International Conference of Benzole Producers,
W72-13771 5A

The Analysis of Trace Organics in Fresh Water by Gas Chromatography -- Mass Spectroscopy,
W72-14057 5A

ORGANIC MATTER
Effect of Mineral Particulates on Microbial Degradation of Solid Organic Materials,
W72-13645 5C

Distribution of Chlorophyll and Its Relation to Particulate Organic Matter in the Offshore Waters of Lake Michigan,
W72-13648 5C

Seasonal Variation of the Suspended Solid Matter, Off the Coast of North Yorkshire,
W72-13682 5B

The Biodegradation of Organic Substrates Under Arctic and Subarctic Conditions,
W72-13822 5C

Investigations of Organic Matter in Groundwater of Oil- and Gas-Bearing Regions (Metodicheskiye issledovaniya v oblasti izucheniya organicheskogo veshchestva podzemnykh vod neftegazonosnykh oblastey),
W72-13856 5B

ORGANIC SOLVENTS
Voltammetry in Methanol, Ethanol, and Sulfolane as Solvents,
W72-13794 5A

OSAKA BAY (JAPAN)
Studies on the Behaviours and Distribution of Radioactive Substances in Coastal and Estuarine Waters,
W72-13976 5B

OSMOSIS
Osmotic Stability and Sodium and Potassium Content of L-Forms of Streptococcus Faecalis,
W72-13764 5C

OSMOTIC PRESSURE
Osmotic Acclimation in the Red River Pupfish, Cyprinodon rubrofluviatilis,
W72-13680 2I

OUTFALLS
Riprapped Basins for Culvert Outfalls,
W72-13751 8A

OUTLETS
Model Studies of Outfall Systems for Desalination Plants (Part II - Estuary Models),
W72-14064 5B

OXIDATION
Ozonation Reactions of Selected Pesticides for Water Pollution Abatement,
W72-13685 5G

Acceleration Units,
W72-13880 5D

Brown and Gray Sands on the Virginia Shelf: Color as a Function of Grain Size,
W72-14017 2J

OXIDATION-REDUCTION POTENTIAL
Chemical Factors that Influence the Availability of Iron and Manganese in Aqueous Systems,
W72-14022 5B

OXYGEN
Variations in Oxygen Consumption by Aquatic Macrophytes in a Changing Environment,
W72-13646 5C

Radiation Treatment of Materials,
W72-13883 5D

OXYGEN CONSUMPTION
Variations in Oxygen Consumption by Aquatic Macrophytes in a Changing Environment,
W72-13646 5C

OXYGEN DEPLETION
Hypothesis for Dissolved Oxygen Depletion in the Central Basin Hypolimnion of Lake Erie,
W72-13659 5C

OXYGEN ELECTRODES
Measurements of Very Low Oxygen Tensions in Unstirred Liquids,
W72-13785 5A

OXYGEN REQUIREMENTS
The Biodegradation of Organic Substrates Under Arctic and Subarctic Conditions,
W72-13822 5C

A Continuously Monitored Respiration Chamber for Fish,
W72-13872 5A

Observations on the Oxygen Needs of Some Species of European Plecoptera,
W72-13874 5C

OYSTERS
Mortality of Pacific Oysters (Crassotrea GIGas): The Influence of Temperature and Enriched Seawater on Oyster Survival,
W72-13875 5C

OZONE
Ozonation Reactions of Selected Pesticides for Water Pollution Abatement,
W72-13685 5G

PACIFIC OCEAN
Sorption-Desorption Reactions of Mercury with Suspended Matter in the Columbia River,
W72-13972 5B

Concentrations of Zinc-65 in Marine Foodstuffs and Pacific Coastal Residents,
W72-13979 5B

PADDY-M
Perpetuation of Bacterial Blight Disease of Paddy and Preservation of Its Incitant: I. Survival of Xanthomonas Oryzae in Water,
W72-14118 5C

PALEOHYDROLOGY
Prehistoric Near-Surface Subsidence Cracks in Western Freshno County, California,
W72-13717 2E

PAMLICO RIVER ESTUARY
Esturine Ecosystems and High Temperatures,
W72-13636 5C

PANAMA
Natural Population Dynamics of Phlebotomine Sandflies in Panama,
W72-14147 2I

PAPER MILL WASTES
Treatment of Waste Liquors from Pulp and Paper Mills,
W72-13896 5D

PARALLEL CHANNEL
A Turbulent Flow Theory of Electrodialysis,
W72-14061 3A

PARAMETRIC LINEAR PROGRAMMING
An Integration of the Agricultural Demand Function for Water and the Hydrologic Model of the Pecos Basin,
W72-13993 6D

PARTICLE SIZE
Tidal Variation of the Suspended Sediment Size Distribution at a Station in Upper Chesapeake Bay,
W72-13837 2L

Inverse Relation Between Foreshore Slope and Mean Grain Size as a Function of the Heavy Mineral Content,
W72-14016 2J

PATENTS
Apparatus for Measuring Properties of a Fluid Body from an Airborne Vehicle,
W72-13876 7B

Flow Stabilizing Through Laminar Separation Apparatus,
W72-13877 5D

Liquid Treating Apparatus,
W72-13878 5D

Reverse Osmosis System,
W72-13879 3A

Acceleration Units,
W72-13880 5D

Method and Means for Detecting Coliform Bacteria in Water,
W72-13881 5A

Vacuum Distillation Process and Apparatus with Direct Air Contact Condensing for Desalination of Water,
W72-13882 3A

Radiation Treatment of Materials,
W72-13883 5D

Oil Pollution Control and Fire Extinguishing Apparatus and Method,
W72-13884 5G

Ion Exchange Apparatus for Treating Liquids,
W72-13885 3A

Desalination Apparatus and Process of Manufacture Using Improved, Acid Grafted Nitrogenous Membranes,
W72-13886 3A

Process for Treating Water with a Polyhalide Resin Using a Semipermeable Membrane Barrier,
W72-13887 5F

Extracting Oil Waste,
W72-13888 5D

Method for Preventing Water Loss from Reservoirs and Channels,
W72-13889 4A

Fluid Separation,
W72-13890 5G

Floating Flexible Skimming Devices,
W72-13891 5G

Process and Apparatus for Obtaining Fresh Water from Saline Water,
W72-13892 3A

Sewage Treatment Apparatus and Method,
W72-13893 5D

Oil Skimming Apparatus,
W72-13894 5G

Control System for Waste Water Treatment Plants,
W72-13895 5D

Treatment of Waste Liquors from Pulp and Paper Mills,
W72-13896 5D

Distillation Apparatus for Desalinisation of Saline Water to Recover Fresh Water as Condensate,
W72-13897 3A

Water Desalting Process and Apparatus,
W72-13898 3A

Chemical Treating Process for Sewage Systems,
W72-13899 5D

Sewage Treating Apparatus and Method,
W72-13900 5D

Method and Apparatus for Use in the Activated Sludge Treatment of Sewage,
W72-13901 5D

Method and Apparatus for Treating Water,
W72-13902 5D

PATH OF POLLUTANTS
Regularities of Sr90 and Cs137 Circulation in Different Links of Food Chain in Zoocoenosis,
W72-13801 5B

Hydrology of Alabama Areas--Cooperative Gulf of Mexico Estuarine Inventory,
W72-13840 5B

Marin Environmental Quality, Suggested Research Programs for Understanding Man's Effect on the Oceans.
W72-13903 5A

Distribution Patterns for Some Particulate and Dissolved Trace Metals Within an Active Glacial Fjord,
W72-13973 5B

Transport and Depletion of Radionuclides in the Columbia River,
W72-13975 5B

Concentrations and Distributions of Long-Lived Fallout Radionuclides in Open Ocean Sediments,
W72-13980 5B

The Geochemistry of Radiocarbon in the Gulf of Mexico,
W72-13981 5B

Anomalous Th228/Th232 and Th230/232 Activity Ratios in Backwater Sediments Along the West Coast of India.
W72-13982 5B

Hanford Atomic Products Operation, January-December 1969.
W72-13991 5B

PATHOGENIC BACTERIA
Mortality of Pacific Oysters (Crassotrea GI-Gas): The Influence of Temperature and Enriched Seawater on Oyster Survival,
W72-13875 5C

Method and Means for Detecting Coliform Bacteria in Water,
W72-13881 5A

PCB
PCBs in Fish from the Milwaukee Region,
W72-13652 5C

PEAT
Chronology of a Kettle-Hole Peat Bog, Cherryfield, Maine,
W72-14019 2J

PECOS RIVER BASIN
An Integration of the Agricultural Demand Function for Water and the Hydrologic Model of the Pecos Basin,
W72-13993 6D

PEDOLOGICAL CARTOGRAPHY
The Use of Aerial Photos in Pedological Cartography of the Area of Transition Between the Tropical Forest and Savanna in the Central Ivory Coast,
W72-14129 7B

PENETRATION
How Rotary Speed and Bit Weight Affect Rotary Drilling Rate,
W72-13631 8C

PENNSYLVANIA
Water Quality of Streams in the Neshaminy Creek Basin, Pennsylvania,
W72-13737 2K

Powers and Duties of the Department of Environmental Resources, Its Officers and Departmental and Advisory Boards and Commissions.
W72-13948 6E

Procedures for Estimating the Hydrologic Impact of Urbanization,
W72-14002 4C

PENTACHLOROPHENOL
Thin-Layer Chromatographic-Enzymatic Identification of Some Lindane- and Possible DDT-Metabolites as well as Pentachlorophenol, (Dunnschichtchromatographisch-Enzymatischer Nachweis Einiger Lindan-Und Theoretisch Moglicher DDT-Metaboliten Sowie Von Pentachlorphenol),
W72-13760 5A

An Artifact in the Gas Chromatographic Determination of Impurities in Pentachlorophenol,
W72-13774 5A

PENTOSE PHOSPHATE
Certain Features of Respiratory Metabolism of Plants Under Conditions of an Increasing Water Deficiency, (In Russian)
W72-14195 3F

PEPPER-D
Sprinkle and Trickle Irrigation of Green Pepper in an Arid Zone,
W72-14089 3F

PERCOLATING WATER
Water Law--Groundwater Rights in Missouri--A Need for Clarification (Higday V. Nickolaus),
W72-13939 6E

PERCOLATION
Some Aspects of Effluent Landspreading,
W72-13712 5D

Equipping Structures of Hydroelectric Power Stations with Measuring Devices for Monitoring Percolation,
W72-13758 8D

Water and Some Nutrients Losses by Deep Percolation as Influenced by the Depth of Water Table,
W72-13923 2G

PERENNIAL STREAMS
Selected Streamflow Characteristics as Related to Channel Geometry of Perennial Streams in Colorado,
W72-13736 2E

PERFORMANCE
Efficient Excavation,
W72-13746 8H

PERISTALTIC PUMPS
Variation of Precision with Time for Autoanalyzer Data,
W72-13763 7B

PERMAFROST
Permafrost in Canada.
W72-13831 7C

PERMEABILITY
Small Diameter Sand Drains,
W72-13756 8D

Freezing Process Studies,
W72-14070 3A

Study of Poly (Methacrylates) and Poly (Urethanes) As Reverse Osmosis Membranes. Effect of Water Clustering on Transport Properties,
W72-14076 3A

PERMSELECTIVE MEMBRANES
Influence of Strongly Bound Counter-Ions on Permselective Membranes,
W72-14073 3A

PERSISTENCE
A Review of the Methods for the Identification of Persistent Hydrocarbon Pollutants on Seas and Beaches,
W72-13766 5A

Oil Pollution: Persistence and Degradation of Spilled Fuel Oil,
W72-13810 5B

PERTURBATION ANALYSIS
Perturbation Analysis of Two-Phase Infiltration,
W72-14006 2G

PESTICIDE MONITORING
A Review of Pesticide Monitoring Programs in California.
W72-14043 7B

PESTICIDE REMOVAL
Endosulfan in the Rhine River,
W72-13847 5C

PESTICIDE RESIDUES
Identification of Organochlorine Pesticide Residues by Ultraviolet Solid-Phase Photolysis,
W72-13786 5A

Pesticide and Mercury Levels in Migrating Duck Populations,
W72-13865 5C

DDT Residues in Eight California Marine Fishes,
W72-13946 5B

PESTICIDE TOXICITY
W72-13864 5C

Some Haematological and Metabolic Changes in Fish Occurring After Pesticide Intoxication (Nektere Hematologicke A Metabolicke Zmenyuryb po Intoxikaci Pesticidy),
W72-13873 5C

PESTICIDES
The Effect of DDT and Dieldrin Upon C-14 Uptake by in Situ Phytoplankton in Lakes Erie and Ontario,
W72-13657 5C

Sandwich KBr Disk for Scanning Volatile Pesticides,
W72-13811 5A

Let Your Irrigation System Do All the Work,
W72-13911 3F

A Review of Pesticide Monitoring Programs in California.
W72-14043 7B

PETROLEUM PRODUCTS
Microdetermination of Carbon, Hydrogen, Nitrogen and Oxygen in Petroleum Compounds with an Automatic Elemental Analyzer,
W72-13805 5A

Titrimetric Determination of Trace Sulfur in Petroleum Using a Lead Ion Selective Electrode,
W72-13806 5A

PETROLOGY
Atlantic Continental Shelf and Slope of the United States-Petrology of the Sand Fraction of Sediments, Northern New Jersey to Southern Florida,
W72-13830 2J

PHARAGMITES-COMMUNIS-M
Allelopathy Among the Aquatic Plants,
W72-14130 2I

PHENOL
Hygienic Standardization of Phenol in Water Bodies (In Russian),
W72-14157 5F

PHENOMENOLOGICAL COEFFICIENTS
Transport Property Requirements of Membranes for Use in Pressure Dialysis Desalination,
W72-14088 3A

PHENYLMECURIC ACETATE
Studies on the Mechanisms of Action of the Antitranspirant Phenylmercuric Acetate, and its Penetration into the Mesophyll,
W72-14149 2I

PHILADELPHIA (PENN)
Procedures for Estimating the Hydrologic Impact of Urbanization,
W72-14002 4C

PHOSPHATES
Variation in the Toxicity of Arsenic Compounds to Microorganisms and the Suppression of the Inhibitory Effects by Phosphate,
W72-13813 5C

A Study of Phosphate Induced Algal Growth in Order to Suppress or Eliminate this Phenomenon,
W72-13992 5A

Determination of the Reserve of Available Phosphates in Irrigated Soils (In Russian),
W72-14169 5B

Inorganic Phosphate Fractions in Calcareous Soils in Relation to Moisture and Incubation Period,
W72-14189 2G

Reaction of Surface-Applied Superphosphate with Soil: I. The Fertilizer Solution and its Initial Reaction With Soil,
W72-14198 5B

PHOSPHORIC ACID
A New Reagent for Detecting Tryptophan, Indole, and Indole-3-Acetic Acid in Thin-Layer Chromatography,
W72-13773 5A

PHOSPHORUS
Availability of Phosphorus for Cladophora Growth in Lake Michigan,
W72-13644 5C

Chlorophyll a - Total Phosphorus Relationships in Lake Erie,
W72-13653 5C

An Intensive Biochemical Survey of Western Lake Erie,
W72-13654 5C

Phosphorus in Wastewater,
W72-14046 5B

Reaction of Surface-Applied Superphosphate with Soil: II. Movement of the Phosphorus and Sulphur into the Soil,
W72-14199 5B

PHOTOGRAPHY
Two-Dimensional Study of Rock Breakage in Drag-Bit Drilling at Atmospheric Pressure,
W72-13625 8C

PHOTOLYSIS
Identification of Organochlorine Pesticide Residues by Ultraviolet Solid-Phase Photolysis,
W72-13786 5A

PHOTOPERIODISM
Development of a Theoretical Seasonal Growth Response Curve of Cladophora Glomerata to Temperature and Photoperiod,
W72-13651 5C

PHOTOSYNTHESIS
Simultaneous Determination of Short-Period Photosynthesis and Evapotranspiration,
W72-14009 3F

A Simple Means of Detaching Tree Shoots Under Water for Physiological Study,
W72-14096 2I

PHYSICAL PROPERTIES
A Study of Light Attenuation in Monterey Bay, California,
W72-13798 5A

Physics of Freshwater Ice (Fizika presnovodnogo l'da),
W72-14037 2C

PHYSICOCHEMICAL PROPERTIES
An Intensive Biochemical Survey of Western Lake Erie,
W72-13654 5C

PHYSICS
Physics of Freshwater Ice (Fizika presnovodnogo l'da),
W72-14037 2C

PHYTOPLANKTERS
Interaction Between the Common Carp (Cyprinus Carpio) and the Silver Carp (Hypothalamichthys Molitrix) in Fish Ponds,
W72-14112 8I

PHYTOPLANKTON
Nutrients, Phytoplankton Productivity and Species Composition as Influenced by Upwelling in Lake Michigan,
W72-13649 5C

Phytoplankton Assemblage Differences at Inshore Versus Offshore Stations in Lake Michigan, and Their Effects on Nutrient Enrichment Experiments,
W72-13650 5C

The Effect of DDT and Dieldrin Upon C-14 Uptake by in Situ Phytoplankton in Lakes Erie and Ontario,
W72-13657 5C

A Quantitative Comparison of Pigment Extraction by Membrane and Glass-Fiber Filters,
W72-13673 5A

Nutrient Studies in Texas Impoundments,
W72-13692 5C

Changes in Plankton Species Composition and Diversity in a Controlled Nutrient Enrichment Study,
W72-13816 5C

Water Quality Predictions Based on Limnological Parameters,
W72-13825 5C

Dynamics of Phytoplankton Primary Production and Biomass in Loviisa Archipelago (Gulf of Finland),
W72-13871 5C

Ecologic Study of Two Small Ponds in the Environs of Wevelgem (West Flanders),
W72-14187 5C

PIENINY NATIONAL PARK
Sarcosphaera Eximia (Dur. et Lev.) R. Mre. in the Pieniny National Park,
W72-13909 2I

PIEZOMETERS
An Electronic Groundwater-Level Detector with Automatic Output Registration,
W72-13729 7B

PILOT PLANTS
Operation of Reverse Osmosis Pilot Plants,
W72-14074 3A

PINUS-CONTORTA-G
Lodgepole Pine-Dwarf Mistletoe Xylem Water Potentials,
W72-14119 2I

PINUS-RADIATA-G
A Simple Means of Detaching Tree Shoots Under Water for Physiological Study,
W72-14096 2I

PITTSBURG (TEX)
Award of P.L. 660 Grant for Construction of Wastewater Treatment Facilities and Outfall Sewers--Project No. WPC-TEX-722 (Draft Environmental Impact Statement).
W72-13949 5D

PLANCTOMYCES
The Influence of Zala River on the Bacteriological Condition in Keszthely-Bay (Lake Balaton),
W72-14154 5C

PLANNING
Comprehensive Abatement Program for an Eutrophic Lake,
W72-13663 5C

The Allocation of Regional Water Supplies. A Case Study of the Northeastern United States,
W72-13698 6B

Responsibility for Plant Operations,
W72-13742 5F

The River Basin Model: Chairman and Council.
W72-13930 6A

Dynamic Multisector Programming Approach to Regional Water Resource Management,
W72-13933 6A

The Northern Maine Regional Treatment System, Aroostook River-Prestile Stream, A Plan for Clean Water, Summary Report.
W72-14049 5D

PLANT GROWTH
Availability of Phosphorus for Cladophora Growth in Lake Michigan,
W72-13644 5C

PLANT GROWTH REGULATORS
Effects of Environmental Conditions and the Coadministration of Growth Retardants on the Response of Sugarcane to Foliar Treatment with Gibberellin,
W72-13924 3F

PLANT TISSUES
Sensitive Fluorescence Method for the Determination of Chlorophyll a/Chlorophyll b Ratios,
W72-13796 5A

PLASTICIZERS
Drying Cellulose Acetate Reverse Osmosis Membranes,
W72-14078 3A

PLATINUM
Platinum Minerals in Quaternary Sediments Between the Anabar and Olenek Rivers (Platinovyye mineraly chetvertichnykh otlozheniy Anabaro-Olenekskogo mezhdurech'ya),
W72-14035 2J

PLEISTOCENE EPOCH
Chronology of a Kettle-Hole Peat Bog, Cherryfield, Maine,
W72-14019 2J

PLUTONIUM
Concentrations and Distributions of Long-Lived Fallout Radionuclides in Open Ocean Sediments,
W72-13980 5B

PODZOLIZED SOILS
The Structural Composition and Water Stability of Podzolized Brown Forest Soils in the Krasnodar Territory, (In Russian),
W72-14178 2G

POISONOUS PLANTS
Comparative Effects of Aquatic Biotoxins on Cardiac Systems,
W72-14056 5C

POLAND
Sarcosphaera Eximia (Dur. et Lev.) R. Mre. in the Pieniny National Park,
W72-13909 2I

POLARIZATION
Study of Membrane-Solution Interfaces by Electro-Chemical Methods,
W72-14075 3A

Continuing Development of a General Mechanistic Theory of Membrane Phenomena and Continuing Experimental and Theoretical Studies of Ion-Exchange Polarization Phenomena,
W72-14085 3A

POLITICAL ASPECTS
Politics and the Colorado River,
W72-13915 6E

The River Basin Model: Chairman and Council.
W72-13930 6A

POLLUTANT CONCENTRATION
Pollutant Concentrations in Abnormal Young Terns from Long Island Sound,
W72-14134 5C

POLLUTANT IDENTIFICATION
An Automated Liquid Chromatographic Method for the Determination of Tetracycline Antibiotics,
W72-13669 5A

Determination of Diethylstilbestrol in Cattle Tissues,
W72-13677 5A

Detection and Measurement of Tritium by Bremsstrahlung Counting,
W72-13679 5A

Development of Lactic Acid Bacteria During Early Stages of Fermentation in Fish Silage,
W72-13683 5A

Thin-Layer Chromatographic-Enzymatic Identification of Some Lindane- and Possible DDT-Metabolites as well as Pentachlorophenol, (Dunnschichtchromatographisch-Enzymatischer Nachweis Einiger Lindan-Und Theoretisch Moglicher DDT-Metaboliten Sowie Von Pentachlorphenol),
W72-13760 5A

A Review of the Methods for the Identification of Persistent Hydrocarbon Pollutants on Seas and Beaches,
W72-13766 5A

Identification of Organochlorine Pesticide Residues by Ultraviolet Solid-Phase Photolysis,
W72-13786 5A

Method for Determination of Mercury in Biological Materials by Neutron Activation Analysis,
W72-13788 5A

Sandwich KBr Disk for Scanning Volatile Pesticides,
W72-13811 5A

Method and Means for Detecting Coliform Bacteria in Water,
W72-13881 5A

Marin Environmental Quality, Suggested Research Programs for Understanding Man's Effect on the Oceans.
W72-13903 5A

POLLUTION
Man and His Environment: Climate,
W72-14137 6G

POLLUTION ABATEMENT
Comprehensive Abatement Program for an Eutrophic Lake,
W72-13663 5C

Ozonation Reactions of Selected Pesticides for Water Pollution Abatement,
W72-13685 5G

Investigation of Sinking Methods for Removal of Oil Pollution from Water Surfaces. Phase II. Methods of Test for Laboratory Evaluation of Oil Sinking Materials,
W72-13702 5G

Flow Stabilizing Through Laminar Separation Apparatus,
W72-13877 5D

Oil Pollution Control and Fire Extinguishing Apparatus and Method,
W72-13884 5G

Method and Apparatus for Treating Water,
W72-13902 5D

A Multilevel Approach to Determining Optimal Taxation for the Abatement of Water Pollution,
W72-13935 5G

Signing of Great Lakes Water Quality Agreement, April 15.
W72-13947 5G

Rural Environmental Assistance Program (Draft Environmental Impact Statement).
W72-13953 5G

POLLUTION TAXES (CHARGES)
A Multilevel Approach to Determining Optimal Taxation for the Abatement of Water Pollution,
W72-13935 5G

POLYCHLORINATED BIPHENYLS
Pollutant Concentrations in Abnormal Young Terns from Long Island Sound,
W72-14134 5C

POLYCHLORINATED NORBORNENES
Metabolism of Polychlorinated Norbornenes by Clostridium butyricum,
W72-13779 5B

POLYELECTROLYTE MEMBRANE
Control of Concentration Polarization in Reverse Osmosis Desalination of Water,
W72-14080 3A

POLYELECTROLYTES
Complexation of Metal Ions with Natural Polyelectrolytes (Removal and Recovery of Metal Ions from Polluted Waters),
W72-13776 5A

Transport Processes in Hyperfiltration Membranes I,
W72-14083 3A

POLYGONAL KARST
Morphometric Analysis of Polygonal Karst in New Guinea,
W72-14018 2J

POLYMERS
Desalination Apparatus and Process of Manufacture Using Improved, Acid Grafted Nitrogenous Membranes,
W72-13886 3A

Method for Preventing Water Loss from Reservoirs and Channels,
W72-13889 4A

POLYPTERIDAE
A Guide to the External Sexing of Some West African Freshwater Fishes,
W72-14145 2I

POLYWATER
Anomalous Water,
W72-13842 1B

POMEGRANATE-D
Effect of Moisture Stress and Indolebutyric Acid on Rooting of Stem Cuttings of Pomegranate (Punica Granatum L.),
W72-14123 3F

PONDEROSA PINE TREES
Use of Forest Attributes in Snowpack Inventory - Prediction Relationships for Arizona Ponderosa Pine,
W72-13996 2C

POTABLE WATER
Evaluation of the Hypoiodous Iodine Tablet - Phase II,
W72-13701 5F

Potable Waters.
W72-13940 5G

Co-precipitation Applied in the Determination of Lead in Drinking Water, (In Serbo-Croatian),
W72-14179 5A

POTAMOGETON-M
Water Plant Communities in Eastern Lower Saxony (I and II), (In German),
W72-14117 5C

POTASSIUM
Variation of Precision with Time for Autoanalyzer Data,
W72-13763 7B

Osmotic Stability and Sodium and Potassium Content of L-Forms of Streptococcus Faecalis,
W72-13764 5C

POTATO-D
Investigations on Rainy Season Potato in the Plateau Region of Chotanagpur,
W72-14091 3F

POTENTIAL WATER SUPPLY
Potentials for Desalting Water in the Tularosa Basin, New Mexico - A Case Study,
W72-14059 3A

POWERED SAMPLES
Precision of Electrical Detection Measurements of Powdered Samples in Spark Source Mass Spectrometry,
W72-13787 5A

PRECIPITATION (ATMOSPHERIC)
Estimating the Wetting of Walls by Driving Rain (Ob otsenke uvlazheniya sten pri kosykh dozhydakh),
W72-13855 7B

Test of Runoff Increase Due To Precipitation Management for the Colorado River Basin Pilot Project,
W72-13912 3B

PRECISION
Gas Liquid Chromatographic Analysis of Hydrocarbon Mixtures. A Report on the Work of the International Conference of Benzole Producers,
W72-13771 5A

Precision of Electrical Detection Measurements of Powdered Samples in Spark Source Mass Spectrometry,
W72-13787 5A

PREHISTORIC WATER EXPLOITATION
Man--The Desert Farmer,
W72-13919 3F

PRESSURE
Measurements of Very Low Oxygen Tensions in Unstirred Liquids,
W72-13785 5A

Growth of Salmonella Typhimurium in Skim Milk Concentrates,
W72-13818 5A

Transport Property Requirements of Membranes for Use in Pressure Dialysis Desalination,
W72-14088 3A

PRESSURE DIALYSIS
Transport Property Requirements of Membranes for Use in Pressure Dialysis Desalination,
W72-14088 3A

PRESSURE-DIFFERENTIAL STICKING
Pressure-Differential Sticking of Drill Pipe and How it Can be Avoided or Relieved,
W72-13630 8C

PRESTRESSED CONCRETE
Short-Time Deflections of Beams Under Single and Repeated Load Cycles,
W72-13749 8F

PRIMARY PRODUCTIVITY
Nutrients, Phytoplankton Productivity and Species Composition as Influenced by Upwelling in Lake Michigan,
W72-13649 5C

Water Quality Predictions Based on Limnological Parameters,
W72-13825 5C

Dynamics of Phytoplankton Primary Production and Biomass in Loviisa Archipelago (Gulf of Finland),
W72-13871 5C

PRIVATE RIGHTS
Oil Pollution of the Marine Environment - A Legal Bibliography,
W72-13904 5G

PROBABILITY
Dynamics of Flood Frequency,
W72-14003 2E

PROFILES
Longitudinal Profiles of Ephemeral Streams in Southeastern Arizona,
W72-14021 2E

PROJECT PLANNING
Rural Environmental Assistance Program (Draft Environmental Impact Statement).
W72-13953 5G

Authorization of Federal Water Projects (Final Report, Draft Review),
W72-13957 6B

PROJECTS
Water Resources Research Catalog, Volume Seven.
W72-13617 9C

PROSOBRANCHS
Salinity Tolerances of Some Common Prosobranchs,
W72-13795 5C

PROTOTYPE TESTS
Roughness Elements as Energy Dissipators of Free-Surface Flow in Circular Pipes,
W72-13747 8B

PROTOZOA
Sampling and Spatial Distribution of Benthonic Foraminifera,
W72-13674 5A

PSYCHROMETER MEASUREMENT
Improved Thermocouple Psychrometer for the Measurement of Plant and Soil Water Potential: II. Operation and Calibration,
W72-14120 7B

PSYCHROMETRIC APPARATUS
Psychrometric Apparatus for Bowen-Ratio Determination Over Forests,
W72-14184 7B

PSYCHROPHILIC MICROORGANISMS
The Biodegradation of Organic Substrates Under Arctic and Subarctic Conditions,
W72-13822 5C

PUBLIC HEALTH
Virus and Water Quality: Occurrence and Control.
W72-13610 5F

Enteric Viruses in Ground and Surface Waters: A Review of their Occurrence and Survival,
W72-13611 5F

The Coliform Test: A Criterion for the Viral Safety of Water,
W72-13612 5F

Removal of Viruses from Water and Wastewater,
W72-13613 5F

Viruses in Water and Wastewater: Effects of some Treatment Methods,
W72-13614 5F

Recent Research Results on Virus Inactivation by Water Treatment Processes,
W72-13615 5F

Relative Resistance of Twenty Human Enteric Viruses to Free Chlorine in Potomac Water,
W72-13616 5F

Pesticide and Mercury Levels in Migrating Duck Populations,
W72-13865 5C

Concentration of Mercury in the Manufacture of Fish Protein Concentrate by Isopropyl Alcohol Extraction of Sheepshead and Carp,
W72-13869 5C

PUBLIC PARTICIPATION
Symposium: Public Involvement in the Water Management Problems in the Great Lakes,
W72-13665 5C

PUBLIC RIGHTS
Oil Pollution of the Marine Environment - A Legal Bibliography,
W72-13904 5G

PUBLIC TRUST DOCTRINE
Private Remedies to Abate Water Pollution in Virginia and New Theories in Environmental Law,
W72-13937 5G

PUERTO RICO
Flooding Along the Rio Piedras in the San Juan Area, Puerto Rico,
W72-13714 7C

PULLULARIA PULLULANS
Effect of Cyclamates on the Growth of Pullularia Pullulans,
W72-13814 5C

PULP AND PAPER INDUSTRY
Sprinkler Irrigation System Solves Waste Water Problems.
W72-13691 5D

PULP WASTES
Treatment of Waste Liquors from Pulp and Paper Mills,
W72-13896 5D

PUMPING
Effect of Pumping Freshwaters Into Oil Strata of the Perm Prikamje on the Distribution of Microflora, (In Russian),
W72-14135 5C

PUNJAB AQUIFER (WEXT PAKISTAN)
Electric Analog Studies of Flow to Wells in the Punjab Aquifer of West Pakistan,
W72-13735 2F

PYRAMID LAKE
The Effects of Increasing Salinity on the Pyramid Lake Fishery,
W72-14054 5C

PYROLYSIS
New Methods for Detection and Quantification in Thin-Layer Chromatography: A Study of Pyrolysis and Combustion Systems,
W72-13768 5A

QUANTIMET 720P PETRISCOPE
The Quantimet 720P for Routine Biological Assay and Potency Calculation from Colony

Count, Inhibition and Exhibition Zone Measurements,
W72-13762 5B

QUATERNARY PERIOD
Platinum Minerals in Quaternary Sediments Between the Anabar and Olenek Rivers (Platinovyye mineraly chetvertichnykh otlozheniy Anabaro-Olenekskogo mezhdurech'ya),
W72-14035 2J

QUO WARRANTO
The Law and the Corporate Polluter: Flexibility and Adaption in the Developing Law of the Environment,
W72-13938 5G

RADIOACTIVE CERIUM
On The Physico-Chemical Behavior of Radioactive Cerium in Sea Water,
W72-13970 5B

RADIOACTIVE WASTE DISPOSAL
Transport and Depletion of Radionuclides in the Columbia River,
W72-13975 5B

Radioactive Waste Management Practices in Western Europe.
W72-13983 5G

RADIOACTIVITY
Radioactivity in Lake Michigan Water and Biota Vicinity of Big Rock Point Nuclear Reactor, 1960-69,
W72-13656 5C

U234/U238 Disequilibrium in Groundwaters of Central Texas,
W72-13971 5B

Radioactive Waste Management Practices in Western Europe.
W72-13983 5G

Environmental Radioactivity at the National Nuclear Research Centre, Pelendaba. Report for the year 1970.
W72-13984 5B

Radiation Data, (Section II - Water).
W72-13988 5A

Radiation Data, (Section II - Water).
W72-13989 5A

Hanford Atomic Products Operation, January-December 1969.
W72-13991 5B

RADIOACTIVITY EFFECTS
Studies on the Behaviours and Distribution of Radioactive Substances in Coastal and Estuarine Waters,
W72-13976 5B

RADIOACTIVITY TECHNIQUES
Detection and Measurement of Tritium by Bremsstrahlung Counting,
W72-13679 5A

RADIOCHEMICAL ANALYSIS
A Modified Plastic Bag Combustion Technique for the Radioassay of C-14 and H-3 in Biological Tissues,
W72-13670 5A

Detection and Measurement of Tritium by Bremsstrahlung Counting,
W72-13679 5A

Determination of Submicrogram Amounts of Boron Using the B-10 (n, alpha) Li-7 Reaction,
W72-13784 5A

RADIOISOTOPE P32
A Study of Phosphate Induced Algal Growth in Order to Suppress or Eliminate this Phenomenon,
W72-13992 5A

RADIOISOTOPES
Radionuclide Concentrations Near the Big Rock Point Nuclear Power Station,
W72-13661 5C

The Removal of Radionuclides From Water by Hydrous Ferric Oxide,
W72-13699 5D

Application of Natural Isotopes in Ground Water Hydrology,
W72-13728 2F

On The Physico-Chemical Behavior of Radioactive Cerium in Sea Water,
W72-13970 5B

Sorption-Desorption Reactions of Mercury with Suspended Matter in the Columbia River,
W72-13972 5B

Adsorption-Desorption Equilibria of Some Radionuclides in Sediment-Freshwater and Sediment-Seawater Systems,
W72-13974 5B

Studies on the Behaviours and Distribution of Radioactive Substances in Coastal and Estuarine Waters,
W72-13976 5B

Concentrations and Distributions of Long-Lived Fallout Radionuclides in Open Ocean Sediments,
W72-13980 5B

Radioactive Waste Management Practices in Western Europe.
W72-13983 5G

Strontium-90 and Cesium-137 in Canned Seafood, Taiwan, Republic of China, 1970-1971,
W72-13990 5A

RAINBOW TROUT
Respiratory and Circulatory Responses of Rainbow Trout Larvae to Carbon Monoxide and to Hypoxia,
W72-14146 5C

Harvest, Survival, and Cost of Two Domestic Strains of Tagged Rainbow Trout Stocked in Lake Berryessa, California,
W72-14181 2H

RAINFALL
An Analysis of the Rainfall Variations in County Leitrim and Their Influence on Agricultural Production,
W72-13713 3F

Estimating the Wetting of Walls by Driving Rain (Ob otsenke uvlazheniya sten pri kosykh dozhydakh),
W72-13855 7B

RAINFALL INTENSITY
Digital Simulation of Thunderstorm Rainfall,
W72-13634 2B

RAINFALL-RUNOFF RELATIONSHIPS
Techniques of Statistical Evaluation of Runoff Results of Precipitation Modification,
W72-13841 2A

Procedures for Estimating the Hydrologic Impact of Urbanization,
W72-14002 4C

Theory of Stochastic Modeling of Watershed Systems,
W72-14007 2A

RARE EARTH
Studies on the Behaviours and Distribution of Radioactive Substances in Coastal and Estuarine Waters,
W72-13976 5B

RATES
How Rotary Speed and Bit Weight Affect Rotary Drilling Rate,
W72-13631 8C

RATES OF APPLICATION
Plants and Wastewater Renovation,
W72-13707 5D

RECHARGE WELLS
Nonsteady Flow in a Recharge Well-Unconfined Aquifer System,
W72-13828 2F

RECLAIMED WATER
An Example of Economic Plating Waste Treatment by Reverse Osmosis,
W72-13687 5D

Experimental Injection of Tertiary-Treated Sewage in a Deep Well at Bay Park, Long Island, N. Y.--A Summary of Early Results,
W72-13839 5B

RECOVERY
Complexation of Metal Ions with Natural Polyelectrolytes (Removal and Recovery of Metal Ions from Polluted Waters),
W72-13776 5A

RECREATION
Natural Resources and Recreation Agencies, 1971 Annual Report.
W72-13945 6E

RECREATION DEMAND
Recreation Benefit Estimation and Forecasting: Implications of the Identification Problem,
W72-13934 6A

The Recreational Value of a Small Reservoir in an Arid Environment,
W72-13994 6D

RED BISHOPS
Notes on a Rhodesian Colony of the Red Bishop,
W72-14142 2I

RED RIVER
Red River Waterway and Red River Waterway Emergency Bank Protection, Mississippi River to Vicinity of Index, Arkansas, Louisiana, Arkansas, Oklahoma, and Texas (Draft Environmental Impact Statement).
W72-13952 8A

REFINERY WASTES
Extracting Oil Waste,
W72-13888 5D

REGIONAL ANALYSIS
The Allocation of Regional Water Supplies. A Case Study of the Northeastern United States,
W72-13698 6B

The River Basin Model: The Social Science Laboratory.
W72-13929 6A

The River Basin Model: Chairman and Council.
W72-13930 6A

Extensions of Mathematical Programming for Regional Water Quality Management,
W72-13931 5G

Dynamic Multisector Programming Approach to Regional Water Resource Management,
W72-13933 6A

REGIONAL WATER QUALITY MANAGEMENT
A Multilevel Approach to Determining Optimal Taxation for the Abatement of Water Pollution,
W72-13935 5G

REGULATION
Permissible Activity Discharge into Receiving Waters Through Radioactive Waste Water from Nuclear Power Plants (Zulassige Aktivitatseinleitung in Vorfluter durch radioaktive Abwasser aus Kernkraftwerken),
W72-13987 5A

REGULATIONS
Formation, Calculation, and Regulation of Streamflow (Formirovaniye, raschety i regulirovaniye rechnogo stoka).
W72-13857 4A

REINFORCED CONCRETE
Column Load Influence on Reinforced Concrete-Beam Column Connection,
W72-13748 8F

Short-Time Deflections of Beams Under Single and Repeated Load Cycles,
W72-13749 8F

The Influence of Reinforcement Detailing on the Strength of Concrete Structures,
W72-13753 8F

REINFORCEMENT
The Influence of Reinforcement Detailing on the Strength of Concrete Structures,
W72-13753 8F

RELIABILITY
Engineering and Economic Evaluation of the Reliability of Water Supply,
W72-13936 6D

RELIABILITY MODELS
Engineering and Economic Evaluation of the Reliability of Water Supply,
W72-13936 6D

REPRODUCIBILITY
A Technique for Curie Point Pyrolysis Gas Chromatography of Complex Biological Samples,
W72-13761 5A

REPRODUCTION
Study of Environmental Impacts of Alternative Long Island Sound Bridge Sites,
W72-13907 6G

Reproduction of Tilapia Nilotica L.,
W72-14042 8I

RESEARCH AND DEVELOPMENT
Water Resources Research Catalog, Volume Seven.
W72-13617 9C

Annual Report, Fiscal Year 1970-1971.
W72-13821 9D

RESEARCH EQUIPMENT
A Continuously Monitored Respiration Chamber for Fish,
W72-13872 5A

RESEARCH LITERATURE
Virus Inactivation by Water Treatment,
W72-13741 5F

RESERVOIR LEAKAGE
Method for Preventing Water Loss from Reservoirs and Channels,
W72-13889 4A

RESERVOIRS
The Recreational Value of a Small Reservoir in an Arid Environment,
W72-13994 6D

Calculation of Rate of Extension of Ice Cover in Afterbays of Reservoirs (Raschet nastupleniya kromki ledyanogo pokrova v nizhikh b'yefakh vodokhranilishch),
W72-14033 2C

RESIDENCE TIME DISTRIBUTION FUNCTIONS
Process Modeling of Biological Waste Treatment,
W72-13694 5D

RESINS
Macroreticular Resins-A Solution To Aggressive Conditions,
W72-13690 5D

RESOURCE DEVELOPMENT
A Framework for Identification and Control of Resource Degradation and Conflict in the Multiple Use of the Coastal Zone,
W72-13906 5G

RESOURCES
A Framework for Identification and Control of Resource Degradation and Conflict in the Multiple Use of the Coastal Zone,
W72-13906 5G

RESPIRATION
Variations in Oxygen Consumption by Aquatic Macrophytes in a Changing Environment,
W72-13646 5C

Effect of Temperature on the Respiration and Cytochromes of an Extreme Thermophile,
W72-13765 5C

Effects of Temperature on the Respiratory Metabolism of Three Chesapeake Bay Bivalves,
W72-13997 5C

RESPIRATORY METABOLISM
Certain Features of Respiratory Metabolism of Plants Under Conditions of an Increasing Water Deficiency, (In Russian)
W72-14195 3F

RESPIRATORY RATES
Effects of Temperature on the Respiratory Metabolism of Three Chesapeake Bay Bivalves,
W72-13997 5C

RESPIROMETERS
A Continuously Monitored Respiration Chamber for Fish,
W72-13872 5A

REVERSE OSMOSIS
An Example of Economic Plating Waste Treatment by Reverse Osmosis,
W72-13687 5D

Reverse Osmosis System,
W72-13879 3A

Reverse Osmosis Membrane Module (Spiral-Wound Concept),
W72-14069 3A

Operation of Reverse Osmosis Pilot Plants,
W72-14074 3A

Study of Poly (Methacrylates) and Poly (Urethanes) As Reverse Osmosis Membranes. Effect of Water Clustering on Transport Properties,
W72-14076 3A

Drying Cellulose Acetate Reverse Osmosis Membranes,
W72-14078 3A

Biological Degradation of Cellulose Acetate Reverse Osmosis Membranes,
W72-14079 3A

Control of Concentration Polarization in Reverse Osmosis Desalination of Water,
W72-14080 3A

Transport Processes in Hyperfiltration Membranes I,
W72-14083 3A

Reverse Osmosis Membrane Module (Spiral Wound Concept),
W72-14087 3A

REVIEWS
Review of Geohydrological Activities in the Netherlands Since World War II, In Particular of the Government Institute for Water Supply,
W72-13721 2F

The Use of Geohydrology in Solving Water Management Problems in Agriculture,
W72-13726 4B

Recent Developments of Physical Investigations in Boreholes and Wells,
W72-13727 4B

Application of Natural Isotopes in Ground Water Hydrology,
W72-13728 2F

Application of Models in Geohydrological Investigations,
W72-13731 2A

RHINE RIVER
The Fish Fauna of the Estuarine Area of the Rhine and Meuse Rivers,
W72-14153 5B

RHODE ISLAND
Report for the 12 Month Period July 1, 1970-June 30, 1971,
W72-14051 5A

RICE-M
A Note on the Response of the Rice Varieties to Varying Water Levels,
W72-14152 3F

RIG COST
Analytical Determination of Optimum Bit Weight and Rotary Speed Combinations,
W72-13619 8C

RIO GRANDE RIVER
Proposed Hybrid Prototype Desalting Plant for Brownsville, Texas (Draft Environmental Impact Statement).
W72-13958 3A

RIO PIEDRAS (P.R.)
Flooding Along the Rio Piedras in the San Juan Area, Puerto Rico,
W72-13714 7C

RIPARIAN RIGHTS
Private Remedies to Abate Water Pollution in Virginia and New Theories in Environmental Law,
W72-13937 5G

RIVER BASINS
Channel Network of a Basin and Formation of Runoff (Ruslovaya set' basseyna i protsess formirovaniya stoka vody),
W72-13853 2E

A Multilevel Approach to Determining Optimal Taxation for the Abatement of Water Pollution,
W72-13935 5G

Proposed Reclassifications of Certain Waters in the Broad, Catawba, French Broad, Hiwassee, Little Tennessee, New, and Watauga River Basins to be Considered at a Public Hearing to be Held on June 29, 1972, in Hickory, North Carolina.
W72-13942 5G

RIVER WEAR
The River Wear: Inorganic Chemistry Relevant to a Biologist,
W72-13866 2K

RIVERS
Development of the Gauya River Valley (Razvitiye doliny reki Gauya),
W72-14034 2J

ROCK EXCAVATION
Efficient Excavation,
W72-13746 8H

ROCK PROPERTIES
Efficient Excavation,
W72-13746 8H

ROCK-SAND DAMS
An Experimental Rock-Sand Dam,
W72-13752 8D

ROCKSLIDES
Growth of a Talus Cone in the Western Chugach Mountains, Alaska,
W72-14026 2J

ROCKY MOUNTAIN REGION
Program Statement for the Proposed Prototype Oil Shale Leasing Program (Draft Environmental Impact Statement).
W72-13969 3E

RODENTS
Present State of Castor Fiber L. Population in the Upper and Middle Flow of the Ubort River and Prospects of Its Economic Use (In Russian),
W72-14159 2I

ROGUE RIVER
Lost Creek Lake Project, Rogue River, Oregon (Draft Environmental Impact Statement).
W72-13965 8D

ROOTED AQUATIC PLANTS
The Ichthyofauna and Flora of Lake St. Louis on the St. Lawrence River Near Montreal, Quebec: General Features and Recent Changes,
W72-13647 5C

ROSWELL (N MEX)
Disposal of Brine by Solar Evaporation,
W72-14077 2D

ROTARY DRILLING
Techniques for Preventing Differential-Pressure Sticking of Drill Pipe,
W72-13618 8C

Analytical Determination of Optimum Bit Weight and Rotary Speed Combinations,
W72-13619 8C

Squeeze Slurries for Lost Circulation Control,
W72-13622 8G

Design and Operation of Jet-Bit Programs for Maximum Hydraulic Horsepower, Impact Force or Jet Velocity,
W72-13626 8C

Ability of Drilling Mud to Lift Bit Cuttings,
W72-13629 8B

Pressure-Differential Sticking of Drill Pipe and How it Can be Avoided or Relieved,
W72-13630 8C

How Rotary Speed and Bit Weight Affect Rotary Drilling Rate,
W72-13631 8C

Why Rock-Bit Bearings Fail,
W72-13632 8G

New Pipe Configuration Reduces Wall Sticking,
W72-13633 8A

ROTARY SPEED
How Rotary Speed and Bit Weight Affect Rotary Drilling Rate,
W72-13631 8C

ROTIFERA PLANKTON
The Horizontal Distribution of Rotifera Plankton in Lake Balaton,
W72-14163 5C

RUNOFF
Channel Network of a Basin and Formation of Runoff (Ruslovaya set' basseyna i protsess formirovaniya stoka vody),
W72-13853 2E

Formation, Calculation, and Regulation of Streamflow (Formirovaniye, raschety i regulirovaniye rechnogo stoka).
W72-13857 4A

Test of Runoff Increase Due To Precipitation Management for the Colorado River Basin Pilot Project,
W72-13912 3B

Reduction of Runoff Into Kara-Bogaz-Gol and the Future Level of the Caspian Sea (Ogranicheniye stoka v zaliv Kara-Bogaz-Gol i budushchiy uroven' Kaspiyskogo morya),
W72-14032 2E

RUNOFF FORECASTING
Techniques of Statistical Evaluation of Runoff Results of Precipitation Modification,
W72-13841 2A

Hydrologic Investigations, Computations, and Forecasts (Voprosy gidrologicheskikh issledovaniy, raschetov i prognozov).
W72-13854 4A

Hydrologic Computations and Forecasts (Voprosy gidrologicheskikh raschetov i prognozov).
W72-14038 4A

RUNOFF MEASUREMENT
Mechanical Balance: Electrical Readout Weighing Lysimeter,
W72-14185 7B

RURAL ENVIRONMENTAL ASSISTANCE PROGRAM
Rural Environmental Assistance Program (Draft Environmental Impact Statement).
W72-13953 5G

SALINE COUNTY (MO)
Groundwater Resources of Saline County, Missouri,
W72-14011 2F

SALINE GROUNDWATER
Potentials for Desalting Water in the Tularosa Basin, New Mexico - A Case Study,
W72-14059 3A

SALINE SOILS
Effect of Land use Period on Soil Properties,
W72-13922 2G

Origin of Saline Soils and Their Regime, Volume 2,
W72-14041 3C

SALINE WATER
Contribution to the Geochemistry of Groundwater in Northern Germany,
W72-13725 2K

Model Studies of Outfall Systems for Desalination Plants (Part II - Estuary Models),
W72-14064 5B

A Study of the Disposal of the Effluent from a Large Desalination Plant,
W72-14086 5B

Effect of Saline Waters on the Germination of Watermelon (Citrullus Vulgaris Schrad. ex Eckl. et Zeyh.),
W72-14126 3C

SALINE WATER INTRUSION
Fresh Water Winning and Salt Water Encroachment in the Amsterdam Dune Water Catchment Area,
W72-13724 4B

Sea Water Intrusion: Morro Bay Area, San Luis Obispo County,
W72-13846 2L

SALINE WATER SYSTEMS
Contribution to the Geochemistry of Groundwater in Northern Germany,
W72-13725 2K

SALINITY
Soil Water Regime in Economic Evaluation of Salinity in Irrigation,
W72-13932 3C

Studies on the Behaviours and Distribution of Radioactive Substances in Coastal and Estuarine Waters,
W72-13976 5B

Origin of Saline Soils and Their Regime, Volume 2,
W72-14041 3C

The Effects of Increasing Salinity on the Pyramid Lake Fishery,
W72-14054 5C

SALMONELLA
Salmonella.
W72-13800 5C

Growth of Salmonella Typhimurium in Skim Milk Concentrates,
W72-13818 5A

SALMONELLA TYPHIMURIUM
Growth of Salmonella Typhimurium in Skim Milk Concentrates,
W72-13818 5A

SALT BALANCE
Origin of Saline Soils and Their Regime, Volume 2,
W72-14041 3C

SALT HYDRATION
A Neutron Scattering Study of the Kinetics of Diffusion and the Relation to the Structures of Ionic Solutions,
W72-14067 1B

SALT RIVER PROJECT
Salt River Project 1971 Annual Report.
W72-13913 4A

SALT TOLERANCE
Salinity Tolerances of Some Common Prosobranchs,
W72-13795 5C

DDT: Inhibition of Sodium Chloride Tolerance by the Blue-Green Alga Anacystis Nidulans,
W72-13809 5C

Salinity Tolerance of Young Blueback Herring, Alosa Aestivalis,
W72-13870 5C

Origin of Saline Soils and Their Regime, Volume 2,
W72-14041 3C

SALVINIA-NATANS-P
Ecology and Production of Salvinia Natans Hiffim; In Kasmir,
W72-14071 2H

SAMPLING
Sampling and Spatial Distribution of Benthonic Foraminifera,
W72-13674 5A

A Device for Collecting In-Situ Samples of Suspended Sediment for Microscopic Analysis,
W72-13693 5A

A New Light Trap for Plankton,
W72-13797 5A

Radiation Data, (Section II - Water).
W72-13988 5A

Radiation Data, (Section II - Water).
W72-13989 5A

SAN DIEGO BAY
Model Studies of Outfall Systems for Desalination Plants (Part II - Estuary Models),
W72-14064 5B

SAND DRAINS
Small Diameter Sand Drains,
W72-13756 8D

SAND FILTERS
The Removal of Coxsackie Virus from Water by Sand Obtained from the Rapid Sand Filters of Water-Plants,
W72-14156 5F

SANDFLIES
Natural Population Dynamics of Phlebotomine Sandflies in Panama,
W72-14147 2I

SANDS
Atlantic Continental Shelf and Slope of the United States-Petrology of the Sand Fraction of Sediments, Northern New Jersey to Southern Florida,
W72-13830 2J

Inverse Relation Between Foreshore Slope and Mean Grain Size as a Function of the Heavy Mineral Content,
W72-14016 2J

Brown and Gray Sands on the Virginia Shelf: Color as a Function of Grain Size,
W72-14017 2J

SANDUSKY (OHIO)
Sandusky Harbor, Erie County, Ohio (Draft Environmental Impact Statement).
W72-13950 5G

SANDWICH KBR DISK PROCEDURE
Sandwich KBr Disk for Scanning Volatile Pesticides,
W72-13811 5A

SANDY CREEK (NY)
Efficiency of Sucrose Flotation in Recovering Insect Larvae From Benthic Stream Samples,
W72-14116 2I

SANITARY ENGINEERING
Geological Considerations of Sanitary Landfill Site Evaluations,
W72-13719 5B

SANTA ANA RIVER CANYON (CALIF)
Water-Quality Reconnaisance of the Lower Santa Ana River Canyon, Southern California,
W72-13720 2K

SARCOSPHAERA EXIMIA
Sarcosphaera Eximia (Dur. et Lev.) R. Mre. in the Pieniny National Park,
W72-13909 2I

SARGASSO SEA
The Annual Cycle in Quantity and Composition of the Zooplankton of the Sargasso Sea Off Bermuda. II. The Surface to 2,000 m,
W72-13775 5B

SCANNING ELECTRON MICROSCOPY
Determination of Submicrogram Amounts of Boron Using the B-10 (n, alpha) Li-7 Reaction,
W72-13784 5A

SCANNING FLUORESCENCE SPECTROMETRY
Characterization of Gas Chromatographic Effluents Via Scanning Fluorescence Spectrometry,
W72-13672 5A

SCAVENGING
Chemical Removal of Drilled Solids,
W72-13624 8G

SCHILBEIDAE
A Guide to the External Sexing of Some West African Freshwater Fishes,
W72-14145 2I

SCHMIDT NUMBERS
A Turbulent Flow Theory of Electrodialysis,
W72-14061 3A

SCOUR
Riprapped Basins for Culvert Outfalls,
W72-13751 8A

SEA ICE
River Discharge into an Ice-Covered Ocean and Related Sediment Dispersal, Beaufort Sea, Coast of Alaska,
W72-14020 2J

SEA LEVEL
Reduction of Runoff Into Kara-Bogaz-Gol and the Future Level of the Caspian Sea (Ogranicheniye stoka v zaliv Kara-Bogaz-Gol i budushchiy uroven' Kaspiyskogo morya),
W72-14032 2E

SEA SALT SOLUTIONS
Properties of Seawater and Its Concentrates and Related Solutions at Temperatures up to 400 Degrees F,
W72-14062 1B

SEA WATER
A Study of Light Attenuation in Monterey Bay, California,
W72-13798 5A

Apparatus for Measuring Properties of a Fluid Body from an Airborne Vehicle,
W72-13876 7B

The Biodegradation of Oil in Seawater for Naval Pollution Control,
W72-14012 5B

Direct Contact Desulfation Laboratory and Pilot Plant Development Study for Softening of Sea Water,
W72-14065 3A

SEALANTS
Squeeze Slurries for Lost Circulation Control,
W72-13622 8G

A New Look at Lost Circulation,
W72-13623 8G

SEASHORES
Ground-Water Geology of the Delaware Atlantic Seashore,
W72-13835 2F

SEASONAL
Development of a Theoretical Seasonal Growth Response Curve of Cladophora Glomerata to Temperature and Photoperiod,
W72-13651 5C

SEASONAL

The Annual Cycle in Quantity and Composition of the Zooplankton of the Sargasso Sea Off Bermuda. II. The Surface to 2,000 m,
W72-13775 5B

SEASONAL VARIATION
Seasonal Variation of the Suspended Solid Matter, Off the Coast of North Yorkshire,
W72-13682 5B

SEAWATER
Properties of Seawater and Its Concentrates and Related Solutions at Temperatures up to 400 Degrees F,
W72-14062 1B

SEDIMENT
Sorption-Desorption Reactions of Mercury with Suspended Matter in the Columbia River,
W72-13972 5B

Studies on the Behaviours and Distribution of Radioactive Substances in Coastal and Estuarine Waters,
W72-13976 5B

SEDIMENT DISTRIBUTION
Distribution Patterns for Some Particulate and Dissolved Trace Metals Within an Active Glacial Fjord,
W72-13973 5B

SEDIMENT SIZE ANALYSIS
Tidal Variation of the Suspended Sediment Size Distribution at a Station in Upper Chesapeake Bay,
W72-13837 2L

SEDIMENT SORTING
Inverse Relation Between Foreshore Slope and Mean Grain Size as a Function of the Heavy Mineral Content,
W72-14016 2J

SEDIMENT TRANSPORT
Tidal Variation of the Suspended Sediment Size Distribution at a Station in Upper Chesapeake Bay,
W72-13837 2L

Suspended Sediment Data Summary March 1966-May 1967, Upper Chesapeake Bay (Tolchester to Havre De Grace),
W72-13849 2L

River Discharge into an Ice-Covered Ocean and Related Sediment Dispersal, Beaufort Sea, Coast of Alaska,
W72-14020 2J

SEDIMENT-WATER INTERFACES
Adsorption-Desorption Equilibria of Some Radionuclides in Sediment-Freshwater and Sediment-Seawater Systems,
W72-13974 5B

SEDIMENTATION
Interpretation of Tracer Tests on Sedimentation Tanks,
W72-13696 5D

Flow Stabilizing Through Laminar Separation Apparatus,
W72-13877 5D

Chronology of a Kettle-Hole Peat Bog, Cherryfield, Maine,
W72-14019 2J

River Discharge into an Ice-Covered Ocean and Related Sediment Dispersal, Beaufort Sea, Coast of Alaska,
W72-14020 2J

New Investigations of Shore Processes (Novyye issledovaniya beregovykh protsessov).
W72-14036 2J

SEDIMENTOLOGY
Geologic Cross Sections Derived from Seismic Profiles and Sediment Cores from Southern Lake Michigan,
W72-13844 2J

Platinum Minerals in Quaternary Sediments Between the Anabar and Olenek Rivers (Platinovyye mineraly chetvertichnykh otlozheniy Anabaro-Olenekskogo mezhdurech'ya),
W72-14035 2J

SEDIMENTS
Evidence for the Eutrophication of Lake Ontario from the Sedimentary Diatom Succession,
W72-13641 5C

A Device for Collecting In-Situ Samples of Suspended Sediment for Microscopic Analysis,
W72-13693 5A

Oil Pollution: Persistence and Degradation of Spilled Fuel Oil,
W72-13810 5B

Concentrations and Distributions of Long-Lived Fallout Radionuclides in Open Ocean Sediments,
W72-13980 5B

Anomalous Th228/Th232 and Th230/232 Activity Ratios in Backwater Sediments Along the West Coast of India.
W72-13982 5B

Platinum Minerals in Quaternary Sediments Between the Anabar and Olenek Rivers (Platinovyye mineraly chetvertichnykh otlozheniy Anabaro-Olenekskogo mezhdurech'ya),
W72-14035 2J

SEEDLINGS
Studies of Moisture Status and Storage Conditions of Spring-Lifted, Mud-Packed Douglas-Fir Seedlings,
W72-14100 2I

SEEDS
Seedbed Preparation and Seeding Methods to Establish Grassed Waterways,
W72-13914 4A

SEEPAGE CONTROL
Method for Preventing Water Loss from Reservoirs and Channels,
W72-13889 4A

SEISMIC PROFILES
Geologic Cross Sections Derived from Seismic Profiles and Sediment Cores from Southern Lake Michigan,
W72-13844 2J

SELENGA RIVER
Water Erosion of Soils on the Right Bank of the Selenga River, (In Russian),
W72-14175 2J

SEMIPERMEABLE MEMBRANES
Process for Treating Water with a Polyhalide Resin Using a Semipermeable Membrane Barrier,
W72-13887 5F

SENSOR
An Improved Soil Water Flux Sensor,
W72-14192 7B

SEPARATION TECHNIQUES
An Automated Liquid Chromatographic Method for the Determination of Tetracycline Antibiotics,
W72-13669 5A

A Quantitative Comparison of Pigment Extraction by Membrane and Glass-Fiber Filters,
W72-13673 5A

Determination of Fluoride in Vegetation Using the Specific Ion Electrode,
W72-13789 5A

Solvent Extraction and Separation of Zirconium, Niobium and Tantalum by 2-Carbethoxy-5-Hydroxy-1- (4-Tolyl)-4-Pyridone,
W72-13807 5A

Water Transport in Hyperfiltration Membranes,
W72-14072 3A

SEPTIC TANKS
Requirements for Approval of Individual Sewage Disposal Systems.
W72-13943 5G

SERUM
Studies on the Determination of Physiological Levels of Chromium in Serum by Gas Chromatography,
W72-13767 5A

SETTLEMENT (STRUCTURAL)
Analysis of Uncertainty in Settlement Prediction,
W72-13745 8D

SETTLING BASINS
Interpretation of Tracer Tests on Sedimentation Tanks,
W72-13696 5D

SEWAGE
Radiation Data, (Section II - Water).
W72-13989 5A

Life History of the Eastern Johnny Darter, Etheostoma Olmstedi Storer, in Cold Tailwater and Sewage-Polluted Water,
W72-13998 5C

SEWAGE DISPOSAL
Requirements for Approval of Individual Sewage Disposal Systems.
W72-13943 5G

SEWAGE EFFLUENT
Contamination of Lettuce Irrigated with Sewage Effluent,
W72-14104 5B

SEWAGE EFFLUENTS
Growth of the Fathead Minnow (Pimephales Promelas) in Tertiary Treatment Ponds,
W72-13868 5C

SEWAGE TREATMENT
Flow Stabilizing Through Laminar Separation Apparatus,
W72-13877 5D

Acceleration Units,
W72-13880 5D

Sewage Treatment Apparatus and Method,
W72-13893 5D

Chemical Treating Process for Sewage Systems,
W72-13899 5D

Sewage Treating Apparatus and Method,
W72-13900 5D

Method and Apparatus for Use in the Activated Sludge Treatment of Sewage,
W72-13901 5D

Award of P.L. 660 Grant for Construction of Wastewater Treatment Facilities and Outfall Sewers--Project No. WPC-TEX-722 (Draft Environmental Impact Statement).
W72-13949 5D

Biological Denitrification Using Fluidized Granular Beds,
W72-14047 5D

Report for the 12 Month Period July 1, 1970-June 30, 1971,
W72-14051 5A

SHORE PROCESSES
New Investigations of Shore Processes (Novyye issledovaniya beregovykh protsessov).
W72-14036 2J

SHORES
Topography and Recent Sediments of the Littoral Zone of Soviet Far Eastern Seas (Osobennosti formirovaniya rel'yefa i sovremennykh osadkov pribrezhnoy zony dal'nevostochnykh morey SSSR).
W72-13860 2J

New Investigations of Shore Processes (Novyye issledovaniya beregovykh protsessov).
W72-14036 2J

SILAGE
Development of Lactic Acid Bacteria During Early Stages of Fermentation in Fish Silage,
W72-13683 5A

SILICA
Anomalous Water,
W72-13842 1B

SILVER
Adsorption-Desorption Equilibria of Some Radionuclides in Sediment-Freshwater and Sediment-Seawater Systems,
W72-13974 5B

SILVER CARP
Interaction Between the Common Carp (Cyprinus Carpio) and the Silver Carp (Hypothalamichthys Molitrix) in Fish Ponds,
W72-14112 8I

SIMULATED RAINFALL
Digital Simulation of Thunderstorm Rainfall,
W72-13634 2B

SIMULATION ANALYSIS
The River Basin Model: Chairman and Council.
W72-13930 6A

Streamflow Synthesis -- A Case Study,
W72-14005 2A

SIZE
Size Distribution of Bacterial Cells,
W72-13667 5A

SLOPES
Erosion Control Practices in Primary Cultivation of Soil on Slopes of the Carpathians, (In Russian),
W72-14170 4D

SMALL WATERSHEDS
Evaluation of a Deterministic Model for Predicting Water Yields from Small Agricultural Watersheds in Virginia,
W72-13824 2A

SNOW
Snowfall and Snow Transport During Snowstorms Over the USSR,
W72-13852 2C

SNOW COVER
Snowfall and Snow Transport During Snowstorms Over the USSR,
W72-13852 2C

SNOW MANAGEMENT
Development of Forest Management Practices for Increasing Snowpack Water Yield,
W72-13995 2C

Use of Forest Attributes in Snowpack Inventory - Prediction Relationships for Arizona Ponderosa Pine,
W72-13996 2C

SNOW TRANSPORT
Snowfall and Snow Transport During Snowstorms Over the USSR,
W72-13852 2C

SNOWFALL
Snowfall and Snow Transport During Snowstorms Over the USSR,
W72-13852 2C

SNOWPACK
Development of Forest Management Practices for Increasing Snowpack Water Yield,
W72-13995 2C

Use of Forest Attributes in Snowpack Inventory - Prediction Relationships for Arizona Ponderosa Pine,
W72-13996 2C

SNOWPACK RUNOFF
Development of Forest Management Practices for Increasing Snowpack Water Yield,
W72-13995 2C

SNOWPACKS
Snowfall and Snow Transport During Snowstorms Over the USSR,
W72-13852 2C

SOCIAL PARTICIPATION
Symposium: Public Involvement in the Water Management Problems in the Great Lakes,
W72-13665 5C

SODIUM
Osmotic Stability and Sodium and Potassium Content of L-Forms of Streptococcus Faecalis,
W72-13764 5C

SODIUM CHLORIDE
DDT: Inhibition of Sodium Chloride Tolerance by the Blue-Green Alga Anacystis Nidulans,
W72-13809 5C

SODIUM CHLORIDE SOLUTIONS
Control of Concentration Polarization in Reverse Osmosis Desalination of Water,
W72-14080 3A

SODIUM SOILS
The Main Physico-Chemical Characteristics of Soils of the Vertisal and Sodium-Containing Type in the Rochefort Marsh at St-Laurent-De-La-Pree (Maritime Charente, France),
W72-14190 2G

SOIL CHEMICAL PROPERTIES
The Soils of the Wooded District of the Southeastern Morne Department: Soil Formation and General Data on Water Management,
W72-13918 2G

SOIL CHEMISTRY
Amide-Water Interaction on Montmorillonite Surface,
W72-13916 2G

SOIL COMPOSITION
The Structural Composition and Water Stability of Podzolized Brown Forest Soils in the Krasnodar Territory, (In Russian),
W72-14178 2G

SOIL CONSERVATION
Seedbed Preparation and Seeding Methods to Establish Grassed Waterways,
W72-13914 4A

Rural Environmental Assistance Program (Draft Environmental Impact Statement).
W72-13953 5G

Winnebago-Bean Creek Watershed, Nebraska (Final Environmental Impact Statement).
W72-13966 4D

SOIL CONTAMINATION
Nickel Pollution,
W72-13778 5A

Chemical Treating Process for Sewage Systems,
W72-13899 5D

SOIL EROSION
Soil Erosion Studies in the Presnovskii Sovkhoz in the Pavlodar Oblast, (In Russian),
W72-14171 2J

Water Erosion of Soils on the Right Bank of the Selenga River, (In Russian),
W72-14175 2J

SOIL HEAT FLOW
Relation of Precipitation to Soil Temperature (2nd Report)--Effect of Soil Moisture on Heat-Exchange in the Soil,
W72-13845 2G

SOIL MOISTURE
A Radiation Mole Flow-Moisture Meter,
W72-13862 7B

Effect of Soil Moisture on the Phase Characters of Hatchlings in the Desert Locust, Schistocerca Gregaria Forsk,
W72-14092 2I

Cell Size in Russet Burbank Potato Tubers With Various Levels of Nitrogen and Soil Moisture Tensions,
W72-14124 3F

Infiltration and Structural Changes as Influenced by Initial Moisture Content,
W72-14196 2G

SOIL MOISTURE

Statistical Studies on the Relation Between Nitrification and Soil Temperature and Soil Moisture,
W72-14200 2G

SOIL MOISTURE STRESS
Effect of Soil-Moisture Stress on the Lipid Quality of Matured Wheat Grains,
W72-14155 3F

SOIL PROFILES
The Soils of the Wooded District of the Southeastern Morne Department: Soil Formation and General Data on Water Management,
W72-13918 2G

SOIL PROPERTIES
Man--The Desert Farmer,
W72-13919 3F

Effect of Land use Period on Soil Properties,
W72-13922 2G

SOIL SALINITY
The Effect of Distance from the Tricklers on Soil Salinity and Growth and Yield of Sweet Corn in an Arid Zone,
W72-14105 3F

SOIL TEMPERATURE
Relation of Precipitation to Soil Temperature (2nd Report)--Effect of Soil Moisture on Heat-Exchange in the Soil,
W72-13845 2G

Transpiration of Antirrhinum Majus L. 'Panama' as Influenced by Soil Temperature,
W72-14102 2D

Statistical Studies on the Relation Between Nitrification and Soil Temperature and Soil Moisture,
W72-14200 2G

SOIL TESTS
A Radiation Mole Flow-Moisture Meter,
W72-13862 7B

SOIL TEXTURE
Wastewater Renovation at Tallahassee - Experimental Studies,
W72-13711 5D

SOIL TYPES
Participation of Moisture Rising from Ground Water in Covering Water Deficiencies Between Evapotranspiration and Precipitations, (In Polish),
W72-14177 2G

SOIL WATER
Relation of Precipitation to Soil Temperature (2nd Report)--Effect of Soil Moisture on Heat-Exchange in the Soil,
W72-13845 2G

Soil Water Regime in Economic Evaluation of Salinity in Irrigation,
W72-13932 3C

Simultaneous Determination of Short-Period Photosynthesis and Evapotranspiration,
W72-14009 3F

SOIL-WATER FLUX
An Improved Soil Water Flux Sensor,
W72-14192 7B

SOIL WATER MOVEMENT
Relation of Precipitation to Soil Temperature (2nd Report)--Effect of Soil Moisture on Heat-Exchange in the Soil,
W72-13845 2G

Perturbation Analysis of Two-Phase Infiltration,
W72-14006 2G

SOIL-WATER -PLANT RELATIONSHIPS
Controlled-Environment Vegetable Production: Results of Trials at Puerto Penasco, Mexico, 1968-1970,
W72-13926 3F

SOIL WATER REDISTRIBUTION
Redistribution of Soil Water After Infiltration,
W72-14197 2G

SOILS
Soil Suitability for Spray Irrigation,
W72-13706 5D

The Use of Aerial Photos in Pedological Cartography of the Area of Transition Between the Tropical Forest and Savanna in the Central Ivory Coast,
W72-14129 7B

Yield and Water Consumption of the Plants Grown in Pots as Influenced by Soil Structure, (In Rumanian),
W72-14173 2G

Erosion-Ameliorative Investigations of Soils in Kazakhstan, (In Russian),
W72-14174 4D

A Hand-Augering Method of Installing Access Tubing for Neutron Moisture Meters,
W72-14194 7B

Reaction of Surface-Applied Superphosphate with Soil: I. The Fertilizer Solution and its Initial Reaction With Soil,
W72-14198 5B

Reaction of Surface-Applied Superphosphate with Soil: II. Movement of the Phosphorus and Sulphur into the Soil,
W72-14199 5B

SOLAR RADIATION
Disposal of Brine by Solar Evaporation,
W72-14077 2D

SOLVENT EXTRACTIONS
Solvent Extraction and Separation of Zirconium, Niobium and Tantalum by 2-Carbethoxy-5-Hydroxy-1- (4-Tolyl)-4-Pyridone,
W72-13807 5A

2-Amino-4-Methylthiazole as a Reagent for the Gravimetric Determination and Extraction of Mercury (II),
W72-13812 5A

SOMATOCHLORA-SEMICIRCULARIS
Drought Resistance in Subalpine Nymphs of Somatochlora Semicircularis Solys (Odonata: Corduliidae),
W72-14183 2I

SORPTION
Sorption-Desorption Reactions of Mercury with Suspended Matter in the Columbia River,
W72-13972 5B

Adsorption-Desorption Equilibria of Some Radionuclides in Sediment-Freshwater and Sediment-Seawater Systems,
W72-13974 5B

SOUTH AFRICA
Environmental Radioactivity at the National Nuclear Research Centre, Pelendaba. Report for the year 1970.
W72-13984 5B

SOUTH CAROLINA
Water Quality Predictions Based on Limnological Parameters,
W72-13825 5C

Kingstree Branch Flood Control Project, South Carolina (Draft Environmental Impact Statement).
W72-13960 4A

SPARK SOURCE MASS SPECTROMETRY
On-Line Computer-Controlled Electrical Detection in Spark Source Mass Spectrometry,
W72-13770 7B

Precision of Electrical Detection Measurements of Powdered Samples in Spark Source Mass Spectrometry,
W72-13787 5A

SPARTINA-M
The Spartina Tidal Marshes of the St. Lawrence Estuary and Their Importance to Aquatic Birds,
W72-14128 2L

SPATIAL DISTRIBUTION
Five Trace Elements and Vitamin B-12 in Cayuga Lake,
W72-13660 5C

Sampling and Spatial Distribution of Benthonic Foraminifera,
W72-13674 5A

Horizontal and Vertical Distribution of the Interstitial Harpacticoid Copepods of a Sandy Beach,
W72-13783 5C

SPAWNING
Study of Environmental Impacts of Alternative Long Island Sound Bridge Sites,
W72-13907 6G

Reproduction of Tilapia Nilotica L.,
W72-14042 8I

SPECTROPHOTOMETRY
Spectrophotometric Method for Determining Low Levels of Water-Soluble Boron in Fertilizers,
W72-13782 5A

Analytical Uses of Charge-Transfer Complexation: Spectrophotometric Method for Iodide in Water,
W72-13792 5A

Spectrophotometric Determination of Trace Quantities of Iron (III) by an Exchange Reaction with Metal Acetylacetonates,
W72-13793 5A

Simple Device for Compensation of Broad-Band Absorption Interference in Flameless Atomic Absorption Determination of Mercury,
W72-13803 5A

The Concentrations of Cadmium, Copper, Iron, Manganese, Molybdenum, Nickel, Vanadium and Zinc in Part of the Tropical Northeast Atlantic Ocean,
W72-13985 5A

SPECTROSCOPY
Tunable Infrared Laser Spectroscopy of Atmospheric Water Vapor,
W72-13732 2B

SPIRAL WOUND MODULE
Reverse Osmosis Membrane Module (Spiral Wound Concept),
W72-14087 3A

SPOIL BANKS
Diked Disposal Area Program, Duluth-Superior Harbor, St. Louis County, Minnesota and Douglas County, Wisconsin (Draft Environmental Impact Statement).
W72-13954 5G

SPRAYING
Aquatic Plant Control Program, Hudson and Mohawk Rivers, New York (Final Environmental Impact Statement).
W72-13967 4A

SPRINKLE IRRIGATION
Sprinkle and Trickle Irrigation of Green Pepper in an Arid Zone,
W72-14089 3F

Sprinkle, Furrow and Trickle Irrigation of Muskmelon in an Arid Zone,
W72-14090 3F

Emergence, Early Growth, and Salinity of Five Vegetable Crops Germinated by Sprinkle and Trickle Irrigation in an Arid Zone,
W72-14106 3F

SPRINKLER IRRIGATION
Soil Suitability for Spray Irrigation,
W72-13706 5D

Plants and Wastewater Renovation,
W72-13707 5D

Engineering Design Criteria for Spray Irrigation,
W72-13709 5D

Actual Spray Field Operations,
W72-13710 5D

Wastewater Renovation at Tallahassee - Experimental Studies,
W72-13711 5D

Wheeler-Dealing: Jackpot in Hay,
W72-13921 3F

The Quality of 'Red Delicious' Apples as Affected by Overtree Sprinkler Irrigation,
W72-14103 3F

SPRINKLER IRRIGATION SYSTEM
Sprinkler Irrigation System Solves Waste Water Problems.
W72-13691 5D

SQUEEZE SLURRIES
Squeeze Slurries for Lost Circulation Control,
W72-13622 8G

ST. CROIX (VI)
V.T.E. Desalting Plant, St. Croix, U.S. Virgin Islands Analysis of Operational Data,
W72-14058 3A

ST. LAWRENCE ESTUARY
The Spartina Tidal Marshes of the St. Lawrence Estuary and Their Importance to Aquatic Birds,
W72-14128 2L

ST. LAWRENCE RIVER
The Ichthyofauna and Flora of Lake St. Louis on the St. Lawrence River Near Montreal, Quebec: General Features and Recent Changes,
W72-13647 5C

STABILITY
Osmotic Stability and Sodium and Potassium Content of L-Forms of Streptococcus Faecalis,
W72-13764 5C

Seedbed Preparation and Seeding Methods to Establish Grassed Waterways,
W72-13914 4A

STABILIZATION
Winnebago-Bean Creek Watershed, Richardson County, Nebraska (Draft Environmental Impact Statement).
W72-13951 4D

Winnebago-Bean Creek Watershed, Nebraska (Final Environmental Impact Statement).
W72-13966 4D

STABLE ISOTOPES
Application of Natural Isotopes in Ground Water Hydrology,
W72-13728 2F

STANDARDS
The Coliform Test: A Criterion for the Viral Safety of Water,
W72-13612 5F

STANDING CROPS
Distribution of Chlorophyll and Its Relation to Particulate Organic Matter in the Offshore Waters of Lake Michigan,
W72-13648 5C

STANFORD WATERSHED MODEL
Evaluation of a Deterministic Model for Predicting Water Yields from Small Agricultural Watersheds in Virginia,
W72-13824 2A

STAPHYLOCOCCUS AUREUS
Loss of Viability by Staphylococcus Aureus in Acidified Media. I., Inactivation by Several Acids, Mixtures of Acids, and Salts of Acids,
W72-13777 5C

STATES RIGHTS
Oil Pollution of the Marine Environment - A Legal Bibliography,
W72-13904 5G

STATISTICAL METHODS
A Statistical Analysis of Base-Flow Flood Discharge Data,
W72-13700 2E

Test of Runoff Increase Due To Precipitation Management for the Colorado River Basin Pilot Project,
W72-13912 3B

STATISTICAL MODELS
A Probabilistic Analysis of Dissolved Oxygen-Biochemical Oxygen Demand Relationship in Streams,
W72-13688 5B

Theory of Stochastic Modeling of Watershed Systems,
W72-14007 2A

STEM DIAMETER
Moisture Stress and Stem Diameter in Young Douglas-Fir,
W72-14098 2I

STEROIDS
Rapid Method for Detection and Characterization of Steroids,
W72-13781 5A

STIRRUPS
Column Load Influence on Reinforced Concrete-Beam Column Connection,
W72-13748 8F

STOCHASTIC MODELS
Theory of Stochastic Modeling of Watershed Systems,
W72-14007 2A

STOCHASTIC PROCESSES
Digital Simulation of Thunderstorm Rainfall,
W72-13634 2B

Theory of Stochastic Modeling of Watershed Systems,
W72-14007 2A

STOMATAL OPENING
The Effect of Fruiting Upon Transpiration Rate and Stomatal Opening in Apple Leaves,
W72-14097 3F

STONEFLIES
Observations on the Oxygen Needs of Some Species of European Plecoptera,
W72-13874 5C

STORM RUNOFF
Procedures for Estimating the Hydrologic Impact of Urbanization,
W72-14002 4C

STORMS
Snowfall and Snow Transport During Snowstorms Over the USSR,
W72-13852 2C

STREAM EROSION
Alluvial Cutoff Dating from Subsequent Growth of a Meander,
W72-14025 2J

STREAM PROFILES
Longitudinal Profiles of Ephemeral Streams in Southeastern Arizona,
W72-14021 2E

STREAM STABILIZATION
A Probabilistic Analysis of Dissolved Oxygen-Biochemical Oxygen Demand Relationship in Streams,
W72-13688 5B

Stuart Gulch Dam, Idaho (Final Environmental Impact Statement).
W72-13968 8D

STREAMFLOW
Selected Streamflow Characteristics as Related to Channel Geometry of Perennial Streams in Colorado,
W72-13736 2E

Formation, Calculation, and Regulation of Streamflow (Formirovaniye, raschety i regulirovaniye rechnogo stoka).
W72-13857 4A

Techniques and Hydrulic Verification of Hydrometric Studies (Metodika i gidravlicheskoye obosnovaniye gidrometricheskikh rabot).
W72-13861 8B

Reduction of Runoff Into Kara-Bogaz-Gol and the Future Level of the Caspian Sea (Ogranicheniye stoka v zaliv Kara-Bogaz-Gol i budushchiy uroven' Kaspiyskogo morya),
W72-14032 2E

STREPTOCOCCUS FAECALIS
Osmotic Stability and Sodium and Potassium Content of L-Forms of Streptococcus Faecalis,
W72-13764 5C

STROBILI DEVELOPMENT
Strobili Development in Western White Pine: Periodicity, Prediction, and Association with Weather,
W72-14121 2I

STRONTIUM
Concentrations and Distributions of Long-Lived Fallout Radionuclides in Open Ocean Sediments,
W72-13980 5B

Radiation Data, (Section II - Water).
W72-13989 5A

Strontium-90 and Cesium-137 in Canned Seafood, Taiwan, Republic of China, 1970-1971,
W72-13990 5A

STRUCTURAL DESIGN
The Influence of Reinforcement Detailing on the Strength of Concrete Structures,
W72-13753 8F

STRUCTURAL GEOLOGY
Nonantecedent Development of Truckee River Canyon, Northern Carson Range, Nevada and California,
W72-14015 2J

STUART GULCH DAM (IDAHO)
Stuart Gulch Dam, Idaho (Final Environmental Impact Statement).
W72-13968 8D

SUBAERIAL
Origin of Saline Soils and Their Regime, Volume 2,
W72-14041 3C

SUBLETHAL EFFECTS
Activity Response to Chlorine in the Brook Trout, Salvelinus Fontinalis (Mitchell),
W72-13867 5C

SUBSTRATE UTILIZATION
Hypertrophic Growth,
W72-13668 5C

Effect of Cyclamates on the Growth of Pullularia Pullulans,
W72-13814 5C

Growth of Endomycopsis Lipolytica on Hydrocarbons,
W72-13817 5A

SUBSURFACE IRRIGATION
Let Your Irrigation System Do All the Work,
W72-13911 3F

SUCROSE FLOTATION
Efficiency of Sucrose Flotation in Recovering Insect Larvae From Benthic Stream Samples,
W72-14116 2I

SULFUR
Titrimetric Determination of Trace Sulfur in Petroleum Using a Lead Ion Selective Electrode,
W72-13806 5A

Reaction of Surface-Applied Superphosphate with Soil: II. Movement of the Phosphorus and Sulphur into the Soil,
W72-14199 5B

SULFUR COMPOUNDS
Sulfuric Acid: Its Potential for Improving Irrigation Water Quality,
W72-13920 5G

SULFUR DIOXIDE
Sulfuric Acid: Its Potential for Improving Irrigation Water Quality,
W72-13920 5G

SULFURIC ACID
Sulfuric Acid: Its Potential for Improving Irrigation Water Quality,
W72-13920 5G

SUPPLY
Recreation Benefit Estimation and Forecasting: Implications of the Identification Problem,
W72-13934 6A

SURFACE ACTIVE AGENTS
Drying Cellulose Acetate Reverse Osmosis Membranes,
W72-14078 3A

SURFACE WATERS
Enteric Viruses in Ground and Surface Waters: A Review of their Occurrence and Survival,
W72-13611 5F

Water-Quality Reconnaisance of the Lower Santa Ana River Canyon, Southern California,
W72-13720 2K

Surface Water Supply of the United States, 1961-65, Part 1. North Atlantic Slope Basins--Volume 2. Basins from New York to Delaware.
W72-13827 7C

Use of Water in Arkansas, 1970,
W72-14028 6D

SURFACES
Amide-Water Interaction on Montmorillonite Surface,
W72-13916 2G

SURVEILLANCE PROGRAM
Radiation Data, (Section II - Water).
W72-13988 5A

SURVEY
Radiation Data, (Section II - Water).
W72-13988 5A

SURVEYS
A Survey of Housewives' Attitudes,
W72-13664 5C

The River Wear: Inorganic Chemistry Relevant to a Biologist,
W72-13866 2K

SUSPENDED LOAD
Suspended Sediment Data Summary March 1966-May 1967, Upper Chesapeake Bay (Tolchester to Havre De Grace),
W72-13849 2L

Sorption-Desorption Reactions of Mercury with Suspended Matter in the Columbia River,
W72-13972 5B

SUSPENDED SEDIMENT
Tidal Variation of the Suspended Sediment Size Distribution at a Station in Upper Chesapeake Bay,
W72-13837 2L

SUSPENDED SEDIMENTS
A Device for Collecting In-Situ Samples of Suspended Sediment for Microscopic Analysis,
W72-13693 5A

SUSPENDED SOLIDS
Seasonal Variation of the Suspended Solid Matter, Off the Coast of North Yorkshire,
W72-13682 5B

Basic Principles of Advanced Waste Treatment,
W72-13705 5D

Tidal Variation of the Suspended Sediment Size Distribution at a Station in Upper Chesapeake Bay,
W72-13837 2L

Suspended Sediment Data Summary March 1966-May 1967, Upper Chesapeake Bay (Tolchester to Havre De Grace),
W72-13849 2L

SWINE WASTES
Swine Waste Characterization and Evaluation of Animal Waste Treatment Alternatives,
W72-13635 5D

SYMPECMA FUSCA
Additions to the List of Odonata of the Dutch Wadden Islands, with an Account of Water Quality Data of Larval Habitats, and a Review of the Dragonfly Fauna of the Dutch and German Northsea Islands,
W72-14162 2I

SYNCHRONIZATION
Synchronization of Cell Division in Escherichia Coli by Elevated Temperatures: A Reinterpretation,
W72-13666 5C

SYNTHESIS
Anomalous Water,
W72-13842 1B

SYNTHETIC HYDROLOGY
Streamflow Synthesis -- A Case Study,
W72-14005 2A

TACHY CARDIA
Respiratory and Circulatory Responses of Rainbow Trout Larvae to Carbon Monoxide and to Hypoxia,
W72-14146 5C

TAILWATER
Life History of the Eastern Johnny Darter, Etheostoma Olmstedi Storer, in Cold Tailwater and Sewage-Polluted Water,
W72-13998 5C

TAIWAN (CHINA)
Strontium-90 and Cesium-137 in Canned Seafood, Taiwan, Republic of China, 1970-1971,
W72-13990 5A

TALKEETNA (ALASKA)
Flood Plain Information, Talkeetna River-Susitna River-Chulitna River, Talkeetna, Alaska.
W72-13836 4A

TALLAHASSEE (FLA)
Environmental Geology and Hydrology, Tallahassee Area, Florida.
W72-13740 6D

TALLASSEE (FLA)
Wastewater Renovation at Tallahassee - Experimental Studies,
W72-13711 5D

TALUS
Growth of a Talus Cone in the Western Chugach Mountains, Alaska,
W72-14026 2J

TANTALUM
Solvent Extraction and Separation of Zirconium, Niobium and Tantalum by 2-Carbethoxy-5-Hydroxy-1- (4-Tolyl)-4-Pyridone,
W72-13807 5A

TELEMETRY
An Electronic Groundwater-Level Detector with Automatic Output Registration,
W72-13729 7B

TEMPERATURE
Development of a Theoretical Seasonal Growth Response Curve of Cladophora Glomerata to Temperature and Photoperiod,
W72-13651 5C

The Biodegradation of Organic Substrates Under Arctic and Subarctic Conditions,
W72-13822 5C

Thermal Effluents from Electrical Power Generation,
W72-13905 5C

On Nitrogen Forms in Dew or Frost Water: II. On the Changes of Nitrogen Dioxide in the Air, (In Japanese),
W72-14186 5B

TENSOR FORM
Transformation of the Tensor Form of Darcy's Law in Inhomogeneous and Anisotropic Soils,
W72-14055 2F

TEPHRA
Weathering of Basaltic Tephra on the Island of Hawaii,
W72-14014 2J

TERNS
Pollutant Concentrations in Abnormal Young Terns from Long Island Sound,
W72-14134 5C

TERRACE CORRELATION
Development of the Gauya River Valley (Razvitiye doliny reki Gauya),
W72-14034 2J

TERTIARY TREATMENT
Proceedings of the Land Spreading Conference at Orlando, Florida on July 15, 1971.
W72-13704 5D

Basic Principles of Advanced Waste Treatment,
W72-13705 5D

Biological Denitrification Using Fluidized Granular Beds,
W72-14047 5D

TEST WELLS
Test-Observation Well Near Davenport, Washington: Description and Preliminary Results,
W72-13733 4B

TESTING
Test of Runoff Increase Due To Precipitation Management for the Colorado River Basin Pilot Project,
W72-13912 3B

TESTING PROCEDURES
A Radiation Mole Flow-Moisture Meter,
W72-13862 7B

TETRACYCLINE ANTIBIOTICS
An Automated Liquid Chromatographic Method for the Determination of Tetracycline Antibiotics,
W72-13669 5A

TEXAS
Nutrient Studies in Texas Impoundments,
W72-13692 5C

Award of P.L. 660 Grant for Construction of Wastewater Treatment Facilities and Outfall Sewers--Project No. WPC-TEX-722 (Draft Environmental Impact Statement).
W72-13949 5D

Laneport, North Fork and South Fork Lakes, San Gabriel River, Texas (Draft Environmental Impact Statement).
W72-13956 8A

Proposed Hybrid Prototype Desalting Plant for Brownsville, Texas (Draft Environmental Impact Statement).
W72-13958 3A

U234/U238 Disequilibrium in Groundwaters of Central Texas,
W72-13971 5B

Records of Wells in Harris County, Texas, 1892-1972,
W72-14027 4B

Development of Ground Water in the El Paso District, Texas, 1963-70,
W72-14029 2F

The Disposal Well Act.
W72-14050 6E

THAU LAKE BASIN
Littoral Oniscoids from the Thau Basin (Mediterranean Littoral Pond): Faunistic and Ecological Study (In French),
W72-14166 2H

THERMAL AQUACULTURE
Thermal Aquaculture: Engineering and Economics,
W72-13743 6B

THERMAL CAPACITY
Properties of Seawater and Its Concentrates and Related Solutions at Temperatures up to 400 Degrees F,
W72-14062 1B

THERMAL POLLUTION
Esturine Ecosystems and High Temperatures,
W72-13636 5C

Influences of Thermal Effluents Upon Aquatic Production in Lake Ontario,
W72-13642 5C

Thermal Aquaculture: Engineering and Economics,
W72-13743 6B

Effects of Temperature on the Respiratory Metabolism of Three Chesapeake Bay Bivalves,
W72-13997 5C

Design and Siting Criteria for Once-Through Cooling Systems Based on a First-Order Thermal Plume Model,
W72-14030 5C

THERMAL POWERPLANTS
Thermal Effluents from Electrical Power Generation,
W72-13905 5C

THERMAL PROPERTIES
Properties of Seawater and Its Concentrates and Related Solutions at Temperatures up to 400 Degrees F,
W72-14062 1B

THERMAL STRATIFICATION
Effect of Eddy Diffusivity on Wind-Driven Currents in a Two-layer Stratified Lake,
W72-14010 2H

THERMISTORS
Apparatus for Measuring Properties of a Fluid Body from an Airborne Vehicle,
W72-13876 7B

THERMODYNAMICS
An Experimental Study of the Structure, Thermodynamics and Kinetic Behavior of Water,
W72-14060 1B

THERMOPHILIC BACTERIA
Effect of Temperature on the Respiration and Cytochromes of an Extreme Thermophile,
W72-13765 5C

THIN CHANNEL FLOW CELL
Control of Concentration Polarization in Reverse Osmosis Desalination of Water,
W72-14080 3A

THIN LAYER CHROMATOGRAPHY
Thin-Layer Chromatographic-Enzymatic Identification of Some Lindane- and Possible DDT-Metabolites as well as Pentachlorophenol, (Dunnschichtchromatographisch-Enzymatischer Nachweis Einiger Lindan-Und Theoretisch Moglicher DDT-Metaboliten Sowie Von Pentachlorphenol),
W72-13760 5A

New Methods for Detection and Quantification in Thin-Layer Chromatography: A Study of Pyrolysis and Combustion Systems,
W72-13768 5A

A New Reagent for Detecting Tryptophan, Indole, and Indole-3-Acetic Acid in Thin-Layer Chromatography,
W72-13773 5A

Rapid Method for Detection and Characterization of Steroids,
W72-13781 5A

THORIUM
Studies on the Behaviours and Distribution of Radioactive Substances in Coastal and Estuarine Waters,
W72-13976 5B

THUNDERSTORMS
Digital Simulation of Thunderstorm Rainfall,
W72-13634 2B

TIDAL EFFECTS
Tidal Variation of the Suspended Sediment Size Distribution at a Station in Upper Chesapeake Bay,
W72-13837 2L

TIDAL MARSHES
The Spartina Tidal Marshes of the St. Lawrence Estuary and Their Importance to Aquatic Birds,
W72-14128 2L

TILAPIA-NILOTICA
Tilapia Fishery in Lake Maruit: Age and Growth of Tilapia Nilotica L. In The Lake,
W72-14000 2H

Reproduction of Tilapia Nilotica L.,
W72-14042 8I

TILLING
Effect of Irrigating Wheat Crop at Different Stages,
W72-14151 3F

TIME
Effect of Land use Period on Soil Properties,
W72-13922 2G

TINTINNOPSIS-OVALIS
The Plankton of Lake Gardno Near the Baltic Sea During the Summer Season,
W72-13637 5C

TISSUE
Determination of Diethylstilbestrol in Cattle Tissues,
W72-13677 5A

TOMATOES-D
The Effect of Light and Humidity on Absorption and Degradation of Diphenamid in Tomatoes,
W72-14125 3F

TOOL FORCES
Two-Dimensional Study of Rock Breakage in Drag-Bit Drilling at Atmospheric Pressure,
W72-13625 8C

TOPOGRAPHY
Topography and Recent Sediments of the Littoral Zone of Soviet Far Eastern Seas (Osobennosti formirovaniya rel'yefa i sovremennykh osadkov pribrezhnoy zony dal'nevostochnykh morey SSSR).
W72-13860 2J

Morphometric Analysis of Polygonal Karst in New Guinea,
W72-14018 2J

Development of the Gauya River Valley (Razvitiye doliny reki Gauya),
W72-14034 2J

New Investigations of Shore Processes (Novyye issledovaniya beregovykh protsessov).
W72-14036 2J

TOXICITY
Chronic Exposure of Rats to Methyl Mercury in Fish Protein,
W72-13780 5C

Variation in the Toxicity of Arsenic Compounds to Microorganisms and the Suppression of the Inhibitory Effects by Phosphate,
W72-13813 5C

Activity Response to Chlorine in the Brook Trout, Salvelinus Fontinalis (Mitchell),
W72-13867 5C

TRACE ELEMENTS
Five Trace Elements and Vitamin B-12 in Cayuga Lake,
W72-13660 5C

Precision of Electrical Detection Measurements of Powdered Samples in Spark Source Mass Spectrometry,
W72-13787 5A

Emission Spectrometric Determination of Trace Amounts of Mercury,
W72-13790 5A

The Concentrations of Cadmium, Copper, Iron, Manganese, Molybdenum, Nickel, Vanadium and Zinc in Part of the Tropical Northeast Atlantic Ocean,
W72-13985 5A

TRACERS
Interpretation of Tracer Tests on Sedimentation Tanks,
W72-13696 5D

Application of Natural Isotopes in Ground Water Hydrology,
W72-13728 2F

TRACHELOMONAS-SP
Ecologic Study of Two Small Ponds in the Environs of Wevelgem (West Flanders),
W72-14187 5C

TRANSFER
Marin Environmental Quality, Suggested Research Programs for Understanding Man's Effect on the Oceans.
W72-13903 5A

TRANSMISSION TOWERS
A Study of Anchorages for Transmission Tower Foundations,
W72-13750 8C

TRANSPIRATION
The Effect of Fruiting Upon Transpiration Rate and Stomatal Opening in Apple Leaves,
W72-14097 3F

Transpiration of Antirrhinum Majus L. 'Panama' as Influenced by Soil Temperature,
W72-14102 2D

TRANSPORT EQUATIONS
A Turbulent Flow Theory of Electrodialysis,
W72-14061 3A

TRANSPORT PHENOMENA
Continuing Development of a General Mechanistic Theory of Membrane Phenomena and Continuing Experimental and Theoretical Studies of Ion-Exchange Polarization Phenomena,
W72-14085 3A

TREATMENT FACILITIES
Higher BOD Removal Via Chemical Additives.
W72-13689 5D

Responsibility for Plant Operations,
W72-13742 5F

Control System for Waste Water Treatment Plants,
W72-13895 5D

TREE SHOOTS
A Simple Means of Detaching Tree Shoots Under Water for Physiological Study,
W72-14096 2I

TRICKLE IRRIGATION
Sprinkle and Trickle Irrigation of Green Pepper in an Arid Zone,
W72-14089 3F

Sprinkle, Furrow and Trickle Irrigation of Muskmelon in an Arid Zone,
W72-14090 3F

Emergence, Early Growth, and Salinity of Five Vegetable Crops Germinated by Sprinkle and Trickle Irrigation in an Arid Zone,
W72-14106 3F

TRICKLERS
The Effect of Distance from the Tricklers on Soil Salinity and Growth and Yield of Sweet Corn in an Arid Zone,
W72-14105 3F

TRICKLING FILTERS
A Literature Search and Critical Analysis of Biological Trickling Filter Studies-Vol. I.
W72-13638 5D

A Literature Search and Critical Analysis of Biological Trickling Filter Studies - Vol II.
W72-13639
Oxygen Uptake and Mechanism of Substrate Purification in a Model Trickling Filter,
W72-13697 5D

Biodegradation of Synthetic Detergents Evaluation by Community Trials: 1. Linear Alkylbenzene Sulfonates,
W72-13703 5D

Removal of Impurities from Trickling Filter Effluents by Coagulation,
W72-13826 5D

TRICLADS
Intraspecific Competition in Lake-Dwelling Triclads: A Laboratory Study,
W72-14132 2H

TRIMERS
An Experimental Study of the Structure, Thermodynamics and Kinetic Behavior of Water,
W72-14060 1B

TRINITY AQUIFER
U234/U238 Disequilibrium in Groundwaters of Central Texas,
W72-13971 5B

TRITIUM
A Modified Plastic Bag Combustion Technique for the Radioassay of C-14 and H-3 in Biological Tissues,
W72-13670 5A

Detection and Measurement of Tritium by Bremsstrahlung Counting,
W72-13679 5A

TROPHIC LEVEL
Glass Effect and the Microbial Plankton-Seston Relation in the Water of Lakes Balaton and Belso,
W72-14161 5C

TROPICAL BAYS
The Hydrological Conditions of Ambaro Bay (Northwestern Madagascar): Contribution to the Study of a Tropical Eutrophic Bay, (In French),
W72-14182 5C

TROUT
The Effects of Increasing Salinity on the Pyramid Lake Fishery,
W72-14054 5C

TROUT LARVAE
Respiratory and Circulatory Responses of Rainbow Trout Larvae to Carbon Monoxide and to Hypoxia,
W72-14146 5C

TRUCKEE RIVER (NEV)
Nonantecedent Development of Truckee River Canyon, Northern Carson Range, Nevada and California,
W72-14015 2J

TRYPTOPHAN
A New Reagent for Detecting Tryptophan, Indole, and Indole-3-Acetic Acid in Thin-Layer Chromatography,
W72-13773 5A

TUCSON (ARIZ)
The Recreational Value of a Small Reservoir in an Arid Environment,
W72-13994 6D

TULAROSA BASIN (NM)
Potentials for Desalting Water in the Tularosa Basin, New Mexico - A Case Study,
W72-14059 3A

TUNNELING MACHINES
Efficient Excavation,
W72-13746 8H

TURBIDOSTATS
The Present Status and Future Prospect of the Turbidostat,
W72-13772 5A

TURBULENCE
An Experimental Study of the Growth of Mechanically Generated Surface Water Waves When Subjected to a Fully Developed Turbulent Channel Airflow,
W72-13734 2E

TURBULENT FLOW
A Turbulent Flow Theory of Electrodialysis,
W72-14061 3A

Control of Concentration Polarization in Reverse Osmosis Desalination of Water,
W72-14080 3A

UBORT RIVER
Present State of Castor Fiber L. Population in the Upper and Middle Flow of the Ubort River and Prospects of Its Economic Use (In Russian),
W72-14159 2I

UKRAINE
Hydrologic Investigations, Computations, and Forecasts (Voprosy gidrologicheskikh issledovaniy, raschetov i prognozov).
W72-13854 4A

Formation, Calculation, and Regulation of Streamflow (Formirovaniye, raschety i regulirovaniye rechnogo stoka).
W72-13857 4A

Problems in the Heat and Water Regime of Agricultural Lands (Voprosy teplovogo i vodnogo rezhima sel'skokhozyaystvennykh poley).
W72-13858 3F

ULTRAVIOLET LIGHT
Use of Ultraviolet Light to Increase the Availablity of Aerial Insects to Caged Bluegill Sunfish,
W72-14140 2I

ULTRAVIOLET RADIATION
Identification of Organochlorine Pesticide Residues by Ultraviolet Solid-Phase Photolysis,
W72-13786 5A

UNDERGROUND WASTE DISPOSAL
The Disposal Well Act.
W72-14050 6E

UNITED NATIONS
The 1973 Conference on the Law of the Sea in the Light of Current Trends in State Seabed Practice,
W72-13941 6E

UNITED STATES
Estimated Use of Water in the United States in 1970,
W72-13829 6D

Atlantic Continental Shelf and Slope of the United States-Petrology of the Sand Fraction of Sediments, Northern New Jersey to Southern Florida,
W72-13830 2J

UNSATURATED FLOW
Perturbation Analysis of Two-Phase Infiltration,
W72-14006 2G

UNSTABLE SOIL
Infiltration and Structural Changes as Influenced by Initial Moisture Content,
W72-14196 2G

UNSTEADY FLOW
Nonsteady Flow in a Recharge Well-Unconfined Aquifer System,
W72-13828 2F

UPLIFT FOOTINGS
A Study of Anchorages for Transmission Tower Foundations,
W72-13750 8C

UPWELLING
Nutrients, Phytoplankton Productivity and Species Composition as Influenced by Upwelling in Lake Michigan,
W72-13649 5C

URANIUM RADIOISOTOPES
U234/U238 Disequilibrium in Groundwaters of Central Texas,
W72-13971 5B

URBAN HYDROLOGY
Procedures for Estimating the Hydrologic Impact of Urbanization,
W72-14002 4C

URBAN SOCIOLOGY
The River Basin Model: The Social Science Laboratory.
W72-13929 6A

URBANIZATION
Procedures for Estimating the Hydrologic Impact of Urbanization,
W72-14002 4C

USSR
Snowfall and Snow Transport During Snowstorms Over the USSR,
W72-13852 2C

Channel Network of a Basin and Formation of Runoff (Ruslovaya set' basseyna i protsess formirovaniya stoka vody),
W72-13853 2E

Hydrologic Investigations, Computations, and Forecasts (Voprosy gidrologicheskikh issledovaniy, raschetov i prognozov).
W72-13854 4A

Investigations of Organic Matter in Groundwater of Oil- and Gas-Bearing Regions (Metodicheskiye issledovaniya v oblasti izucheniya organicheskogo veshchestva podzemnykh vod neftegazonosnykh oblastey),
W72-13856 5B

Formation, Calculation, and Regulation of Streamflow (Formirovaniye, raschety i regulirovaniye rechnogo stoka).
W72-13857 4A

Problems in the Heat and Water Regime of Agricultural Lands (Voprosy teplovogo i vodnogo rezhima sel'skokhozyaystvennykh poley).
W72-13858 3F

Problems in Hydrologic Instrumentation (Voprosy gidrologicheskogo priborostroyeniya).
W72-13859 7B

Topography and Recent Sediments of the Littoral Zone of Soviet Far Eastern Seas (Osobennosti formirovaniya rel'yefa i sovremennykh osadkov pribrezhnoy zony dal'nevostochnykh morey SSSR).
W72-13860 2J

Techniques and Hydrulic Verification of Hydrometric Studies (Metodika i gidravlicheskoye obosnovaniye gidrometricheskikh rabot).
W72-13861 8B

Use of Capillary Columns to Study Infiltration of Water Into Frozen Soil (Skhema kapillyarnykh kolonn dlya vpityvaniya vody v merzlyy grunt),
W72-14031 2G

Reduction of Runoff Into Kara-Bogaz-Gol and the Future Level of the Caspian Sea (Ogranicheniye stoka v zaliv Kara-Bogaz-Gol i budushchiy uroven' Kaspiyskogo morya),
W72-14032 2E

Calculation of Rate of Extension of Ice Cover in Afterbays of Reservoirs (Raschet nastupleniya kromki ledyanogo pokrova v nizhikh b'yefakh vodokhranilishch),
W72-14033 2C

Development of the Gauya River Valley (Razvitiye doliny reki Gauya),
W72-14034 2J

Platinum Minerals in Quaternary Sediments Between the Anabar and Olenek Rivers (Platinovyye mineraly chetvertichnykh otlozheniy Anabaro-Olenekskogo mezhdurech'ya),
W72-14035 2J

New Investigations of Shore Processes (Novyye issledovaniya beregovykh protsessov).
W72-14036 2J

Physics of Freshwater Ice (Fizika presnovodnogo l'da),
W72-14037 2C

Hydrologic Computations and Forecasts (Voprosy gidrologicheskikh raschetov i prognozov).
W72-14038 4A

Hydrodynamics of Free-Boundary Flows,
W72-14040 8B

Origin of Saline Soils and Their Regime, Volume 2,
W72-14041 3C

UTAH
Authorized China Meadows Dam and Reservoir Lyman Project, Wyoming (Draft Environmental Impact Statement).
W72-13963 8D

Ground-Water Conditions in Utah, Spring of 1972,
W72-14023 4B

UTAH VALLEY
Future Water Use Model of Utah Valley,
W72-13928 4A

VACUUM STRIPPING
Freezing Process Studies,
W72-14070 3A

VALLEYS
Development of the Gauya River Valley (Razvitiye doliny reki Gauya),
W72-14034 2J

VANADIUM
Neutron-Activation Determination of Vanadium in Oils and Catalysts,
W72-13804 5A

VEGETABLE CROPS
Controlled-Environment Vegetable Production: Results of Trials at Puerto Penasco, Mexico, 1968-1970,
W72-13926 3F

VEGETATION
Nickel Pollution,
W72-13778 5A

Determination of Fluoride in Vegetation Using the Specific Ion Electrode,
W72-13789 5A

VEGETATION EFFECTS
Plants and Wastewater Renovation,
W72-13707 5D

Aquatic Plant Control Program, Hudson and Mohawk Rivers, New York (Final Environmental Impact Statement).
W72-13967 4A

VERTICAL TUBE EVAPORATORS
V.T.E. Desalting Plant, St. Croix, U.S. Virgin Islands Analysis of Operational Data,
W72-14058 3A

VERTISOL SOILS
The Main Physico-Chemical Characteristics of Soils of the Vertisal and Sodium-Containing Type in the Rochefort Marsh at St-Laurent-De-La-Pree (Maritime Charente, France),
W72-14190 2G

VIABILITY
Loss of Viability by Staphylococcus Aureus in Acidified Media. I., Inactivation by Several Acids, Mixtures of Acids, and Salts of Acids,
W72-13777 5C

VIRGIN ISLANDS
V.T.E. Desalting Plant, St. Croix, U.S. Virgin Islands Analysis of Operational Data,
W72-14058 3A

VIRGINIA
Higher BOD Removal Via Chemical Additives.
W72-13689 5D

Private Remedies to Abate Water Pollution in Virginia and New Theories in Environmental Law,
W72-13937 5G

Brown and Gray Sands on the Virginia Shelf: Color as a Function of Grain Size,
W72-14017 2J

VIRUS INACTIVATION
Virus Inactivation by Water Treatment,
W72-13741 5F

VIRUSES
Virus and Water Quality: Occurrence and Control.
W72-13610 5F

Enteric Viruses in Ground and Surface Waters: A Review of their Occurrence and Survival,
W72-13611 5F

The Coliform Test: A Criterion for the Viral Safety of Water,
W72-13612 5F

Viruses in Water and Wastewater: Effects of some Treatment Methods,
W72-13614 5F

Recent Research Results on Virus Inactivation by Water Treatment Processes,
W72-13615 5F

Relative Resistance of Twenty Human Enteric Viruses to Free Chlorine in Potomac Water,
W72-13616 5F

Virus Rem Oval by Chemical Coagulation,
W72-13684 5D

Virus Inactivation by Water Treatment,
W72-13741 5F

VISCOSITIES
Properties of Seawater and Its Concentrates and Related Solutions at Temperatures up to 400 Degrees F,
W72-14062 1B

VITAMIN B
Five Trace Elements and Vitamin B-12 in Cayuga Lake,
W72-13660 5C

VOLATILITY
Sandwich KBr Disk for Scanning Volatile Pesticides,
W72-13811 5A

VOLCANIC ASH
Weathering of Basaltic Tephra on the Island of Hawaii,
W72-14014 2J

VOLCANOES
Weathering of Basaltic Tephra on the Island of Hawaii,
W72-14014 2J

VOLTAMMETRY
Voltammetry in Methanol, Ethanol, and Sulfolane as Solvents,
W72-13794 5A

VOLUMETRIC ANALYSIS
Wax-Bound Lead Dioxide Potentiometric Electrode and Applications to Chelometric Titration,
W72-13676 5A

Titrimetric Determination of Trace Sulfur in Petroleum Using a Lead Ion Selective Electrode,
W72-13806 5A

Optimization of Dissolved Oxygen Measurements,
W72-14066 5A

WALES
Nickel Pollution,
W72-13778 5A

WALLS
Estimating the Wetting of Walls by Driving Rain (Ob otsenke uvlazheniya sten pri kosykh dozhydakh),
W72-13855 7B

WASHINGTON
Test-Observation Well Near Davenport, Washington: Description and Preliminary Results,
W72-13733 4B

Natural Resources and Recreation Agencies, 1971 Annual Report.
W72-13945 6E

WASTE ASSIMILATIVE CAPACITY
Plants and Wastewater Renovation,
W72-13707 5D

WASTE DISPOSAL
Proceedings of the Land Spreading Conference at Orlando, Florida on July 15, 1971.
W72-13704 5D

Geological Considerations of Sanitary Landfill Site Evaluations,
W72-13719 5B

The Disposal Well Act.
W72-14050 6E

Exploratory Study of Brine Disposal Using Fluid-Bed Evaporation,
W72-14063 5E

A Study of the Disposal of the Effluent from a Large Desalination Plant,
W72-14086 5B

WASTE DISPOSAL WELLS
The Disposal Well Act.
W72-14050 6E

WASTE HEAT
Thermal Aquaculture: Engineering and Economics,
W72-13743 6B

Controlled-Environment Vegetable Production: Results of Trials at Puerto Penasco, Mexico, 1968-1970,
W72-13926 3F

WASTE IDENTIFICATION
Swine Waste Characterization and Evaluation of Animal Waste Treatment Alternatives,
W72-13635 5D

WASTE WATER DISPOSAL
Sprinkler Irrigation System Solves Waste Water Problems.
W72-13691 5D

WASTE WATER SAMPLING
Biodegradation of Synthetic Detergents Evaluation by Community Trials: 1. Linear Alkylbenzene Sulfonates,
W72-13703 5D

WASTE WATER TREATMENT
Removal of Viruses from Water and Wastewater,
W72-13613 5F

Swine Waste Characterization and Evaluation of Animal Waste Treatment Alternatives,
W72-13635 5D

A Literature Search and Critical Analysis of Biological Trickling Filter Studies-Vol. I.
W72-13638 5D

Virus Rem Oval by Chemical Coagulation,
W72-13684 5D

An Example of Economic Plating Waste Treatment by Reverse Osmosis,
W72-13687 5D

Macroreticular Resins-A Solution To Aggressive Conditions,
W72-13690 5D

Process Modeling of Biological Waste Treatment,
W72-13694 5D

Interpretation of Tracer Tests on Sedimentation Tanks,
W72-13696 5D

Oxygen Uptake and Mechanism of Substrate Purification in a Model Trickling Filter,
W72-13697 5D

The Removal of Radionuclides From Water by Hydrous Ferric Oxide,
W72-13699 5D

Proceedings of the Land Spreading Conference at Orlando, Florida on July 15, 1971.
W72-13704 5D

Basic Principles of Advanced Waste Treatment,
W72-13705 5D

Soil Suitability for Spray Irrigation,
W72-13706 5D

Plants and Wastewater Renovation,
W72-13707 5D

Engineering Design Criteria for Spray Irrigation,
W72-13709 5D

Actual Spray Field Operations,
W72-13710 5D

Wastewater Renovation at Tallahassee - Experimental Studies,
W72-13711 5D

Some Aspects of Effluent Landspreading,
W72-13712 5D

Removal of Impurities from Trickling Filter Effluents by Coagulation,
W72-13826 5D

Flow Stabilizing Through Laminar Separation Apparatus,
W72-13877 5D

Liquid Treating Apparatus,
W72-13878 5D

Acceleration Units,
W72-13880 5D

Radiation Treatment of Materials,
W72-13883 5D

Extracting Oil Waste,
W72-13888 5D

Fluid Separation,
W72-13890 5G

Sewage Treatment Apparatus and Method,
W72-13893 5D

Control System for Waste Water Treatment Plants,
W72-13895 5D

Treatment of Waste Liquors from Pulp and Paper Mills,
W72-13896 5D

Chemical Treating Process for Sewage Systems,
W72-13899 5D

Sewage Treating Apparatus and Method,
W72-13900 5D

Method and Apparatus for Use in the Activated Sludge Treatment of Sewage,
W72-13901 5D

Method and Apparatus for Treating Water,
W72-13902 5D

Award of P.L. 660 Grant for Construction of Wastewater Treatment Facilities and Outfall Sewers--Project No. WPC-TEX-722 (Draft Environmental Impact Statement).
W72-13949 5D

The Northern Maine Regional Treatment System, Aroostook River-Prestile Stream, A Plan for Clean Water, Summary Report.
W72-14049 5D

WATER ALLOCATION
Economic Efficiency in the Allocation of Irrigation Water Over Time,
W72-13823 6B

WATER ALLOCATION (POLICY)
The River Basin Model: Chairman and Council.
W72-13930 6A

WATER ANALYSIS
Analytical Uses of Charge-Transfer Complexation: Spectrophotometric Method for Iodide in Water,
W72-13792 5A

The River Wear: Inorganic Chemistry Relevant to a Biologist,
W72-13866 2K

WATER BALANCE
Problems in the Heat and Water Regime of Agricultural Lands (Voprosy teplovogo i vodnogo rezhima sel'skokhozyaystvennykh poley).
W72-13858 3F

WATER BALANCE (ANURAN)
Studies on Anuran Water Balance: II. Desiccation in the Australian Frog, Notaden Bennetti,
W72-14133 2I

WATER CHEMISTRY
Anomalous Water,
W72-13842 1B

Investigations of Organic Matter in Groundwater of Oil- and Gas-Bearing Regions (Metodicheskiye issledovaniya v oblasti izucheniya organicheskogo veshchestva podzemnykh vod neftegazonosnykh oblastey),
W72-13856 5B

The River Wear: Inorganic Chemistry Relevant to a Biologist,
W72-13866 2K

Amide-Water Interaction on Montmorillonite Surface,
W72-13916 2G

Carbonate Chemistry of Aquifer and Stream Water in Kentucky,
W72-14004 2F

The Genesis of Selected Hydrochemical Facies in Baton Rouge, Louisiana, Ground Waters,
W72-14008 2F

Brown and Gray Sands on the Virginia Shelf: Color as a Function of Grain Size,
W72-14017 2J

WATER CLUSTERING
Study of Poly (Methacrylates) and Poly (Urethanes) As Reverse Osmosis Membranes. Effect of Water Clustering on Transport Properties,
W72-14076 3A

WATER CONSERVATION
Declaring War....On Mesquite,
W72-13925 3B

WATER CONSUMPTION
Yield and Water Consumption of the Plants Grown in Pots as Influenced by Soil Structure, (In Rumanian),
W72-14173 2G

WATER DEMAND
Estimated Use of Water in the United States in 1970,
W72-13829 6D

The River Basin Model: Chairman and Council.
W72-13930 6A

Engineering and Economic Evaluation of the Reliability of Water Supply,
W72-13936 6D

An Integration of the Agricultural Demand Function for Water and the Hydrologic Model of the Pecos Basin,
W72-13993 6D

The Recreational Value of a Small Reservoir in an Arid Environment,
W72-13994 6D

WATER DISTRIBUTION (APPLIED)
Estimated Use of Water in the United States in 1970,
W72-13829 6D

WATER DISTRICTS
Analysis--Florida Water Resources Act of 1972, (Chapter 72-299, Laws of Florida).
W72-13944 6E

WATER FLUX
Study of Poly (Methacrylates) and Poly (Urethanes) As Reverse Osmosis Membranes. Effect of Water Clustering on Transport Properties,
W72-14076 3A

WATER HARVESTING
Test of Runoff Increase Due To Precipitation Management for the Colorado River Basin Pilot Project,
W72-13912 3B

WATER IMPORTATION
An Integration of the Agricultural Demand Function for Water and the Hydrologic Model of the Pecos Basin,
W72-13993 6D

WATER LAW
Oil Pollution of the Marine Environment - A Legal Bibliography,
W72-13904 5G

WATER LAW

Air Code and Water Quality Criteria for Interstate Streams for State of Arkansas.
W72-14044 6E

WATER LEVEL

The Effects of Increasing Salinity on the Pyramid Lake Fishery,
W72-14054 5C

WATER LEVEL RECORDERS

An Electronic Groundwater-Level Detector with Automatic Output Registration,
W72-13729 7B

Equipping Structures of Hydroelectric Power Stations with Measuring Devices for Monitoring Percolation,
W72-13758 8D

WATER LEVELS

An Electronic Groundwater-Level Detector with Automatic Output Registration,
W72-13729 7B

Reduction of Runoff Into Kara-Bogaz-Gol and the Future Level of the Caspian Sea (Ogranicheniye stoka v zaliv Kara-Bogaz-Gol i budushchiy uroven' Kaspiyskogo morya),
W72-14032 2E

A Note on the Response of the Rice Varieties to Varying Water Levels,
W72-14152 3F

WATER LOSS

Method for Preventing Water Loss from Reservoirs and Channels,
W72-13889 4A

WATER MANAGEMENT (APPLIED)

The Use of Geohydrology in Solving Water Management Problems in Agriculture,
W72-13726 4B

Salt River Project 1971 Annual Report.
W72-13913 4A

Future Water Use Model of Utah Valley,
W72-13928 4A

Dynamic Multisector Programming Approach to Regional Water Resource Management,
W72-13933 6A

WATER MEASUREMENT

Equipping Structures of Hydroelectric Power Stations with Measuring Devices for Monitoring Percolation,
W72-13758 8D

WATER POLLUTION

Oil Pollution of the Marine Environment - A Legal Bibliography,
W72-13904 5G

Private Remedies to Abate Water Pollution in Virginia and New Theories in Environmental Law,
W72-13937 5G

Phosphorus in Wastewater,
W72-14046 5B

WATER POLLUTION CONTROL

Geological Considerations of Sanitary Landfill Site Evaluations,
W72-13719 5B

Fresh Water Winning and Salt Water Encroachment in the Amsterdam Dune Water Catchment Area,
W72-13724 4B

Report for the 12 Month Period July 1, 1970-June 30, 1971,
W72-14051 5A

WATER POLLUTION EFFECTS

Esturine Ecosystems and High Temperatures,
W72-13636 5C

Effect of Cyclamates on the Growth of Pullularia Pullulans,
W72-13814 5C

W72-13864 5C

Concentration of Mercury in the Manufacture of Fish Protein Concentrate by Isopropyl Alcohol Extraction of Sheepshead and Carp,
W72-13869 5C

Life History of the Eastern Johnny Darter, Etheostoma Olmstedi Storer, in Cold Tailwater and Sewage-Polluted Water,
W72-13998 5C

Chlorinated Hydrocarbon, Microparticulate Effects on Microorganisms Isolated from Lake Erie,
W72-13999 5C

Design and Siting Criteria for Once-Through Cooling Systems Based on a First-Order Thermal Plume Model,
W72-14030 5C

WATER POLLUTION SOURCES

Nitrate Contamination of the Water-Table Aquifer in Delaware,
W72-13834 5B

Hydrology of Alabama Areas--Cooperative Gulf of Mexico Estuarine Inventory,
W72-13840 5B

Preliminary Report on Techniques for Marine Monitoring Systems,
W72-13850 5B

Transport and Depletion of Radionuclides in the Columbia River,
W72-13975 5B

Mussels and Barnacles as Indicators of the Variation of Manganese-54, Cobalt-60 and Zinc-65 in the Marine Environment,
W72-13978 5B

The Biodegradation of Oil in Seawater for Naval Pollution Control,
W72-14012 5B

WATER POLLUTION TREATMENT

Endosulfan in the Rhine River,
W72-13847 5C

Extensions of Mathematical Programming for Regional Water Quality Management,
W72-13931 5G

WATER POTENTIAL

Improved Thermocouple Psychrometer for the Measurement of Plant and Soil Water Potential: II. Operation and Calibration,
W72-14120 7B

WATER PRICING

An Integration of the Agricultural Demand Function for Water and the Hydrologic Model of the Pecos Basin,
W72-13993 6D

WATER PROFILES

Water Profile Fluctuations Recorded Beneath Some Forage Plants During the Dry Season Using the Neutron Method, (In French),
W72-14138 7B

WATER PROPERTIES

A Neutron Scattering Study of the Kinetics of Diffusion and the Relation to the Structures of Ionic Solutions,
W72-14067 1B

WATER PURIFICATION

Basic Principles of Advanced Waste Treatment,
W72-13705 5D

Potable Waters.
W72-13940 5G

WATER QUALITY

Virus and Water Quality: Occurrence and Control.
W72-13610 5F

Enteric Viruses in Ground and Surface Waters: A Review of their Occurrence and Survival,
W72-13611 5F

The Coliform Test: A Criterion for the Viral Safety of Water,
W72-13612 5F

Removal of Viruses from Water and Wastewater,
W72-13613 5F

Viruses in Water and Wastewater: Effects of some Treatment Methods,
W72-13614 5F

Relative Resistance of Twenty Human Enteric Viruses to Free Chlorine in Potomac Water,
W72-13616 5F

W72-13655 5C

Ground Water in Kearny County, Southwestern Kansas,
W72-13715 7C

Ground-Water Resources of McLean County, West-Central North Dakota,
W72-13716 7C

Water-Quality Reconnaisance of the Lower Santa Ana River Canyon, Southern California,
W72-13720 2K

Water Quality of Streams in the Neshaminy Creek Basin, Pennsylvania,
W72-13737 2K

Effects of Land Use on Municipal Watersheds,
W72-13759 4C

General Ground-Water Quality in Fresh-Water Aquifers of Delaware,
W72-13832 5B

Fish and Wildlife in the Marine and Coastal Zone, Part A, Summary Planning Information, and Recommendations,
W72-13908 6G

Groundwater Resources of Saline County, Missouri,
W72-14011 2F

Water for Alabama, The Alabama Water-Resources Spectrum--Second Progress Report,
W72-14024 5G

Indiana Water Quality, 1969, Monitor Station Records--Rivers and Streams.
W72-14045 7B

West Virginia Water Quality Network.
W72-14048 7B

The Northern Maine Regional Treatment System, Aroostook River-Prestile Stream, A Plan for Clean Water, Summary Report.
W72-14049 5D

Report for the 12 Month Period July 1, 1970-June 30, 1971,
W72-14051 5A

WATER QUALITY CONTROL
Extensions of Mathematical Programming for Regional Water Quality Management,
W72-13931 5G

A Multilevel Approach to Determining Optimal Taxation for the Abatement of Water Pollution,
W72-13935 5G

The Law and the Corporate Polluter: Flexibility and Adaption in the Developing Law of the Environment,
W72-13938 5G

Signing of Great Lakes Water Quality Agreement, April 15.
W72-13947 5G

Air Code and Water Quality Criteria for Interstate Streams for State of Arkansas.
W72-14044 6E

WATER QUALITY CRITERIA
Air Code and Water Quality Criteria for Interstate Streams for State of Arkansas.
W72-14044 6E

WATER QUALITY STANDARDS
Esturine Ecosystems and High Temperatures,
W72-13636 5C

Potable Waters.
W72-13940 5G

Requirements for Approval of Individual Sewage Disposal Systems.
W72-13943 5G

Hygienic Standardization of Phenol in Water Bodies (In Russian),
W72-14157 5F

WATER RECOVERY
Transport Property Requirements of Membranes for Use in Pressure Dialysis Desalination,
W72-14088 3A

WATER RESOURCES
Environmental Geology and Hydrology, Tallahassee Area, Florida.
W72-13740 6D

Proposed Reclassifications of Certain Waters in the Broad, Catawba, French Broad, Hiwassee, Little Tennessee, New, and Watauga River Basins to be Considered at a Public Hearing to be Held on June 29, 1972, in Hickory, North Carolina.
W72-13942 5G

WATER RESOURCES DEVELOPMENT
Water Resources Research Catalog, Volume Seven.
W72-13617 9C

The Use of Geohydrology in Solving Water Management Problems in Agriculture,
W72-13726 4B

Water Quality of Streams in the Neshaminy Creek Basin, Pennsylvania,
W72-13737 2K

Techniques of Statistical Evaluation of Runoff Results of Precipitation Modification,
W72-13841 2A

Powers and Duties of the Department of Environmental Resources, Its Officers and Departmental and Advisory Boards and Commissions.
W72-13948 6E

Authorization of Federal Water Projects (Final Report, Draft Review),
W72-13957 6B

Water for Alabama, The Alabama Water-Resources Spectrum--Second Progress Report,
W72-14024 5G

WATER RESOURCES INSTITUTE
Annual Report, Fiscal Year 1970-1971.
W72-13821 9D

WATER RESOURCES RESEARCH CATALOG
Water Resources Research Catalog, Volume Seven.
W72-13617 9C

WATER REUSE
Basic Principles of Advanced Waste Treatment,
W72-13705 5D

WATER SAMPLING
Indiana Water Quality, 1969, Monitor Station Records--Rivers and Streams.
W72-14045 7B

West Virginia Water Quality Network.
W72-14048 7B

WATER SOFTENING
Reverse Osmosis System,
W72-13879 3A

Ion Exchange Apparatus for Treating Liquids,
W72-13885 3A

Direct Contact Desulfation Laboratory and Pilot Plant Development Study for Softening of Sea Water,
W72-14065 3A

WATER STORAGE
Review of California's Regional Water Supply Systems and Possible Applications of Desalting,
W72-13917 3B

WATER STRUCTURE
Anomalous Water,
W72-13842 1B

An Experimental Study of the Structure, Thermodynamics and Kinetic Behavior of Water,
W72-14060 1B

A Neutron Scattering Study of the Kinetics of Diffusion and the Relation to the Structures of Ionic Solutions,
W72-14067 1B

WATER SUPPLY
The Allocation of Regional Water Supplies. A Case Study of the Northeastern United States,
W72-13698 6B

Ground-Water Resources of McLean County, West-Central North Dakota,
W72-13716 7C

Virus Inactivation by Water Treatment,
W72-13741 5F

Responsibility for Plant Operations,
W72-13742 5F

Effects of Land Use on Municipal Watersheds,
W72-13759 4C

Estimated Use of Water in the United States in 1970,
W72-13829 6D

Ground-Water Occurrence in the Maryland Piedmont,
W72-13848 2F

Review of California's Regional Water Supply Systems and Possible Applications of Desalting,
W72-13917 3B

Future Water Use Model of Utah Valley,
W72-13928 4A

Engineering and Economic Evaluation of the Reliability of Water Supply,
W72-13936 6D

Proposed Hybrid Prototype Desalting Plant for Brownsville, Texas (Draft Environmental Impact Statement).
W72-13958 3A

Water for Alabama, The Alabama Water-Resources Spectrum--Second Progress Report,
W72-14024 5G

Use of Water in Arkansas, 1970,
W72-14028 6D

Development of Ground Water in the El Paso District, Texas, 1963-70,
W72-14029 2F

Report for the 12 Month Period July 1, 1970-June 30, 1971,
W72-14051 5A

WATER TABLE
Wastewater Renovation at Tallahassee - Experimental Studies,
W72-13711 5D

Water and Some Nutrients Losses by Deep Percolation as Influenced by the Depth of Water Table,
W72-13923 2G

WATER TEMPERATURE
Esturine Ecosystems and High Temperatures,
W72-13636 5C

Apparatus for Measuring Properties of a Fluid Body from an Airborne Vehicle,
W72-13876 7B

Effects of Temperature on the Respiratory Metabolism of Three Chesapeake Bay Bivalves,
W72-13997 5C

WATER TRANSPORT PROPERTIES
Study of Poly (Methacrylates) and Poly (Urethanes) As Reverse Osmosis Membranes. Effect of Water Clustering on Transport Properties,
W72-14076 3A

WATER TREATMENT
Virus and Water Quality: Occurrence and Control.
W72-13610 5F

The Coliform Test: A Criterion for the Viral Safety of Water,
W72-13612 5F

Removal of Viruses from Water and Wastewater,
W72-13613 5F

Viruses in Water and Wastewater: Effects of some Treatment Methods,
W72-13614 5F

Recent Research Results on Virus Inactivation by Water Treatment Processes,
W72-13615 5F

Relative Resistance of Twenty Human Enteric Viruses to Free Chlorine in Potomac Water,
W72-13616 5F

Evaluation of the Hypoiodous Iodine Tablet - Phase II,
W72-13701 5F

Virus Inactivation by Water Treatment,
W72-13741 5F

Process for Treating Water with a Polyhalide Resin Using a Semipermeable Membrane Barrier,
W72-13887 5F

Method and Apparatus for Treating Water,
W72-13902 5D

WATER TREATMENT PLANT OPERATIONS
Responsibility for Plant Operations,
W72-13742 5F

WATER TYPES
An Experimental Study of the Structure, Thermodynamics and Kinetic Behavior of Water,
W72-14060 1B

WATER USERS
The River Basin Model: Chairman and Council.
W72-13930 6A

Analysis--Florida Water Resources Act of 1972, (Chapter 72-299, Laws of Florida).
W72-13944 6E

WATER UTILIZATION
Estimated Use of Water in the United States in 1970,
W72-13829 6D

Fish and Wildlife in the Marine and Coastal Zone, Part A, Summary Planning Information, and Recommendations,
W72-13908 6G

Salt River Project 1971 Annual Report.
W72-13913 4A

Future Water Use Model of Utah Valley,
W72-13928 4A

Analysis--Florida Water Resources Act of 1972, (Chapter 72-299, Laws of Florida).
W72-13944 6E

Powers and Duties of the Department of Environmental Resources, Its Officers and Departmental and Advisory Boards and Commissions.
W72-13948 6E

Use of Water in Arkansas, 1970,
W72-14028 6D

WATER VAPOR
Tunable Infrared Laser Spectroscopy of Atmospheric Water Vapor,
W72-13732 2B

WATER WELLS
Ground Water in Kearny County, Southwestern Kansas,
W72-13715 7C

Electric Analog Studies of Flow to Wells in the Punjab Aquifer of West Pakistan,
W72-13735 2F

Geology and Ground Water, University of Delaware, Newark, Delaware,
W72-13833 4B

Ground-Water Occurrence in the Maryland Piedmont,
W72-13848 2F

Groundwater Resources of Saline County, Missouri,
W72-14011 2F

Development of Ground Water in the El Paso District, Texas, 1963-70,
W72-14029 2F

WATER YIELD
Ground-Water Resources of McLean County, West-Central North Dakota,
W72-13716 7C

Geohydrological Investigations with a View to Groundwater Catchment--A Case History,
W72-13723 4B

Effects of Land Use on Municipal Watersheds,
W72-13759 4C

Evaluation of a Deterministic Model for Predicting Water Yields from Small Agricultural Watersheds in Virginia,
W72-13824 2A

WATER YIELD IMPROVEMENT
Development of Forest Management Practices for Increasing Snowpack Water Yield,
W72-13995 2C

Use of Forest Attributes in Snowpack Inventory - Prediction Relationships for Arizona Ponderosa Pine,
W72-13996 2C

WATERCHESTNUT
Aquatic Plant Control Program, Hudson and Mohawk Rivers, New York (Final Environmental Impact Statement).
W72-13967 4A

WATERMELON-D
Effect of Saline Waters on the Germination of Watermelon (Citrullus Vulgaris Schrad. ex Eckl. et Zeyh.),
W72-14126 3C

WATERSHED MANAGEMENT
Water Quality of Streams in the Neshaminy Creek Basin, Pennsylvania,
W72-13737 2K

Effects of Land Use on Municipal Watersheds,
W72-13759 4C

Winnebago-Bean Creek Watershed, Richardson County, Nebraska (Draft Environmental Impact Statement).
W72-13951 4D

WAVE GROWTH RATES
An Experimental Study of the Growth of Mechanically Generated Surface Water Waves When Subjected to a Fully Developed Turbulent Channel Airflow,
W72-13734 2E

WAVE PILE-UP
An Experimental Study of the Growth of Mechanically Generated Surface Water Waves When Subjected to a Fully Developed Turbulent Channel Airflow,
W72-13734 2E

WAVES (WATER)
An Experimental Study of the Growth of Mechanically Generated Surface Water Waves When Subjected to a Fully Developed Turbulent Channel Airflow,
W72-13734 2E

WEATHER FORECASTING
Four-Dimensional World-Wide Atmospheric Models (Surface to 25 Km Altitude),
W72-13843 2B

WEATHER MODIFICATION
Techniques of Statistical Evaluation of Runoff Results of Precipitation Modification,
W72-13841 2A

WEATHERING
Weathering of Basaltic Tephra on the Island of Hawaii,
W72-14014 2J

WEED CONTROL
Declaring War....On Mesquite,
W72-13925 3B

Aquatic Plant Control Program, Hudson and Mohawk Rivers, New York (Final Environmental Impact Statement).
W72-13967 4A

WEIRS
Epidemiological and Ecological Aspects Due to the Construction of River Weirs in the Tropical Regions,
W72-13819 5C

WELL DATA
Records of Wells in Harris County, Texas, 1892-1972,
W72-14027 4B

WELL INVENTORY
Records of Wells in Harris County, Texas, 1892-1972,
W72-14027 4B

WELL IRRIGATION
Cropping Pattern in Relation to Well Irrigation,
W72-14150 3F

WELL REGULATIONS
The Disposal Well Act.
W72-14050 6E

WEST PAKISTAN
Electric Analog Studies of Flow to Wells in the Punjab Aquifer of West Pakistan,
W72-13735 2F

WEST VIRGINIA
West Virginia Water Quality Network.
W72-14048 7B

WESTERN LAKE ERIE
An Intensive Biochemical Survey of Western Lake Erie,
W72-13654 5C

WESTERN WHITE PINE
Strobili Development in Western White Pine: Periodicity, Prediction, and Association with Weather,
W72-14121 2I

WETLANDS
Water Bank Program (Draft Environmental Impact Statement).
W72-13959 6G

WETTING
Prehistoric Near-Surface Subsidence Cracks in Western Freshno County, California,
W72-13717 2E

Estimating the Wetting of Walls by Driving Rain (Ob otsenke uvlazheniya sten pri kosykh dozhydakh),
W72-13855 7B

WHEAT-M
Effect of Irrigating Wheat Crop at Different Stages,
W72-14151 3F

Effect of Soil-Moisture Stress on the Lipid Quality of Matured Wheat Grains,
W72-14155 3F

Certain Features of Respiratory Metabolism of Plants Under Conditions of an Increasing Water Deficiency, (In Russian)
W72-14195 3F

WHITE SEA
New Investigations of Shore Processes (Novyye issledovaniya beregovykh protsessov).
W72-14036 2J

WHITSAND BAY
Horizontal and Vertical Distribution of the Interstitial Harpacticoid Copepods of a Sandy Beach,
W72-13783 5C

WILDLIFE
Fish and Wildlife in the Marine and Coastal Zone, Part A, Summary Planning Information, and Recommendations,
W72-13908 6G

WIND-DRIVEN CURRENTS
Effect of Eddy Diffusivity on Wind-Driven Currents in a Two-layer Stratified Lake,
W72-14010 2H

WIND VELOCITY
On Some Modifications in the Venetian Climate During the Last Thirty Years: Repercussions of the Phenomenon of Flood Waters,
W72-13757 2B

WINDS
Effect of Eddy Diffusivity on Wind-Driven Currents in a Two-layer Stratified Lake,
W72-14010 2H

WINKLER METHOD
Optimization of Dissolved Oxygen Measurements,
W72-14066 5A

WINNEBAGO-BEAN CREEK WATERSHED (NEB)
Winnebago-Bean Creek Watershed, Richardson County, Nebraska (Draft Environmental Impact Statement).
W72-13951 4D

Winnebago-Bean Creek Watershed, Nebraska (Final Environmental Impact Statement).
W72-13966 4D

WISCONSIN
Responses of a Brook Trout (Salvelinus Fontinalis) Population to Habitat Development in Lawrence Creek,
W72-14108 8I

WITHDRAWAL
Fresh Water Winning and Salt Water Encroachment in the Amsterdam Dune Water Catchment Area,
W72-13724 4B

WOOD PULPING WASTES
Treatment of Waste Liquors from Pulp and Paper Mills,
W72-13896 5D

WOOD WASTES
Treatment of Waste Liquors from Pulp and Paper Mills,
W72-13896 5D

WYOMING
Authorized China Meadows Dam and Reservoir Lyman Project, Wyoming (Draft Environmental Impact Statement).
W72-13963 8D

XANTHOMONAS-ORYZAE
Perpetuation of Bacterial Blight Disease of Paddy and Preservation of Its Incitant: I. Survival of Xanthomonas Oryzae in Water,
W72-14118 5C

XYLEM WATER POTENTIAL
Lodgepole Pine-Dwarf Mistletoe Xylem Water Potentials,
W72-14119 2I

YAKUTSK ASSR
Platinum Minerals in Quaternary Sediments Between the Anabar and Olenek Rivers (Platinovyye mineraly chetvertichnykh otlozheniy Anabaro-Olenekskogo mezhdurech'ya),
W72-14035 2J

YEASTS
Growth of Endomycopsis Lipolytica on Hydrocarbons,
W72-13817 5A

ZIRCONIUM
Solvent Extraction and Separation of Zirconium, Niobium and Tantalum by 2-Carbethoxy-5-Hydroxy-1- (4-Tolyl)-4-Pyridone,
W72-13807 5A

ZOOGLOEA
The Influence of Zala River on the Bacteriological Condition in Keszthely-Bay (Lake Balaton),
W72-14154 5C

ZOOPLANKTON
The Decline of the Large Zooplankter, Limnocalanus Macrurus Sars (Copepoda: Calanoida), in Lake Erie,
W72-13643 5C

The Annual Cycle in Quantity and Composition of the Zooplankton of the Sargasso Sea Off Bermuda. II. The Surface to 2,000 m,
W72-13775 5B

A New Light Trap for Plankton,
W72-13797 5A

AUTHOR INDEX

ABERNATHY, A. R.
Water Quality Predictions Based on Limnological Parameters,
W72-13825 5C

ABOLTYN'SH, O. P.
Development of the Gauya River Valley (Razvitiye doliny reki Gauya),
W72-14034 2J

ADAMS, J. I.
A Study of Anchorages for Transmission Tower Foundations,
W72-13750 8C

ADLARD, E. R.
A Review of the Methods for the Identification of Persistent Hydrocarbon Pollutants on Seas and Beaches,
W72-13766 5A

AGISHEV, M. K.
Determination of the Reserve of Available Phosphates in Irrigated Soils (In Russian),
W72-14169 5B

AHLSTROM, J. A.
Studies on the Determination of Physiological Levels of Chromium in Serum by Gas Chromatography,
W72-13767 5A

AHMAD, M.
Electric Analog Studies of Flow to Wells in the Punjab Aquifer of West Pakistan,
W72-13735 2F

AKIN, E. W.
Enteric Viruses in Ground and Surface Waters: A Review of their Occurrence and Survival,
W72-13611 5F

Relative Resistance of Twenty Human Enteric Viruses to Free Chlorine in Potomac Water,
W72-13616 5F

ALEXA, L.
The Effect of Certain Chlorinated Organic Pesticides on Hygienic Indicators of Water,
W72-14164 5C

ALEXANDER, L. G.
Performance Characteristics of Advanced Evaporator Tubes for Long-Tube Vertical Evaporators (An Addendum),
W72-14068 3A

ALLEN, P. H. III
Biological Degradation of Cellulose Acetate Reverse Osmosis Membranes,
W72-14079 3A

ALY, M. M.
Spectrophotometric Determination of Trace Quantities of Iron (III) by an Exchange Reaction with Metal Acetylacetonates,
W72-13793 5A

AMUNDSON, C. H.
Growth of Salmonella Typhimurium in Skim Milk Concentrates,
W72-13818 5A

ANDERSON, J. H.
Water Desalting Process and Apparatus,
W72-13898 3A

ANEMAET, J. D.
The Analysis of Trace Organics in Fresh Water by Gas Chromatography -- Mass Spectroscopy,
W72-14057 5A

ARAD, N.
Engineering and Economic Evaluation of the Reliability of Water Supply,
W72-13936 6D

ARMSTRONG, F.
Two-Dimensional Study of Rock Breakage in Drag-Bit Drilling at Atmospheric Pressure,
W72-13625 8C

ARNOLD, D. C.
Salinity Tolerances of Some Common Prosobranchs,
W72-13795 5C

ARNWINE, W. C.
Potentials for Desalting Water in the Tularosa Basin, New Mexico - A Case Study,
W72-14059 3A

ARROYO, A.
Neutron-Activation Determination of Vanadium in Oils and Catalysts,
W72-13804 5A

ARVOLA, W. A.
California High Water, 1969-1970,
W72-14013 2E

ASCIONE, P. P.
An Automated Liquid Chromatographic Method for the Determination of Tetracycline Antibiotics,
W72-13669 5A

ASHTON, W. M.
Nickel Pollution,
W72-13778 5A

AUBURN, F. M.
The 1973 Conference on the Law of the Sea in the Light of Current Trends in State Seabed Practice,
W72-13941 6E

AYRES, J. E.
Man--The Desert Farmer,
W72-13919 3F

BACHMANN, R. W.
Growth of the Fathead Minnow (Pimephales Promelas) in Tertiary Treatment Ponds,
W72-13868 5C

BAGG, J. F.
Study of Environmental Impacts of Alternative Long Island Sound Bridge Sites,
W72-13907 6G

BAGGE, P.
Dynamics of Phytoplankton Primary Production and Biomass in Loviisa Archipelago (Gulf of Finland),
W72-13871 5C

BAILIE, R. E.
V.T.E. Desalting Plant, St. Croix, U.S. Virgin Islands Analysis of Operational Data,
W72-14058 3A

BAJOLLE, JEAN-ERIC
Freezing Process Studies,
W72-14070 3A

BAKER, D. T.
Versatile Colorimetric Coulometer,
W72-13802 2K

BAKER, R. L.
Determination of Fluoride in Vegetation Using the Specific Ion Electrode,
W72-13789 5A

BALDINA, A. L.
Effect of Pumping Freshwaters Into Oil Strata of the Perm Prikamje on the Distribution of Microflora, (In Russian),
W72-14135 5C

BALLSCHMITER, K.
Metabolism of Polychlorinated Norbornenes by Clostridium butyricum,
W72-13779 5B

BANARESCU, P.
Competition and Its Bearing on the Freshwater Faunas,
W72-14176 2I

BARAKAT, M. A.
Water and Some Nutrients Losses by Deep Percolation as Influenced by the Depth of Water Table,
W72-13923 2G

BARGUR, J.
Dynamic Multisector Programming Approach to Regional Water Resource Management,
W72-13933 6A

BARKSDALE, H. C.
Water for Alabama, The Alabama Water-Resources Spectrum--Second Progress Report,
W72-14024 5G

BARTSCH, S. R.
Growth of a Talus Cone in the Western Chugach Mountains, Alaska,
W72-14026 2J

BARUAH, J. N.
Growth of Endomycopsis Lipolytica on Hydrocarbons,
W72-13817 5A

BATTERTON, J. C.
DDT: Inhibition of Sodium Chloride Tolerance by the Blue-Green Alga Anacystis Nidulans,
W72-13809 5C

BAULT, E. I.
Hydrology of Alabama Areas--Cooperative Gulf of Mexico Estuarine Inventory,
W72-13840 5B

BEACHEY, J.
An Experimental Study of the Structure, Thermodynamics and Kinetic Behavior of Water,
W72-14060 1B

BECKER, R.
Process and Apparatus for Obtaining Fresh Water from Saline Water,
W72-13892 3A

BEER, C.
Biological Denitrification Using Fluidized Granular Beds,
W72-14047 5D

BEETON, A. M.
The Decline of the Large Zooplankter, Limnocalanus Macrurus Sars (Copepoda: Calanoida), in Lake Erie,
W72-13643 5C

BEITER, D. P.
Digital Computer Modeling of Limestone Groundwater Systems,
W72-14001 2F

BELL, W. H.
Thermal Effluents from Electrical Power Generation,
W72-13905 5C

BELLAMY, L. S.
Intraspecific Competition in Lake-Dwelling Triclads: A Laboratory Study,
W72-14132 2H

BENEDETTO, L.
Observations on the Oxygen Needs of Some Species of European Plecoptera,
W72-13874 5C

BENNETT, G. D.
Electric Analog Studies of Flow to Wells in the Punjab Aquifer of West Pakistan,
W72-13735 2F

BENTON, W. H.
Enteric Viruses in Ground and Surface Waters: A Review of their Occurrence and Survival,
W72-13611 5F

BERG, G.
Removal of Viruses from Water and Wastewater,
W72-13613 5F

BERRY, D. J.
The Quantimet 720P for Routine Biological Assay and Potency Calculation from Colony Count, Inhibition and Exhibition Zone Measurements,
W72-13762 5B

BESPALYI, P. S.
A Radiation Mole Flow-Moisture Meter,
W72-13862 7B

BHATIA, I. S.
Effect of Soil-Moisture Stress on the Lipid Quality of Matured Wheat Grains,
W72-14155 3F

BICHURINA, A. A.
Certain Features of Respiratory Metabolism of Plants Under Conditions of an Increasing Water Deficiency, (In Russian)
W72-14195 3F

BILLINGS, G. K.
The Genesis of Selected Hydrochemical Facies in Baton Rouge, Louisiana, Ground Waters,
W72-14008 2F

BINGHAM, R. T.
Strobili Development in Western White Pine: Periodicity, Prediction, and Association with Weather,
W72-14121 2I

BINGLEY, W. M.
Responsibility for Plant Operations,
W72-13742 5F

BISHOP, M.
Engineering Design Criteria for Spray Irrigation,
W72-13709 5D

BISHOP, R.
Pesticide and Mercury Levels in Migrating Duck Populations,
W72-13865 5C

BLACK, T. A.
Psychrometric Apparatus for Bowen-Ratio Determination Over Forests,
W72-14184 7B

BLACKWALL, F. L. C.
Contamination of Lettuce Irrigated with Sewage Effluent,
W72-14104 5B

BLAKE, C. T.
Titrimetric Determination of Trace Sulfur in Petroleum Using a Lead Ion Selective Electrode,
W72-13806 5A

BLANC, CHARLES P.
Analysis of the Environmental Factors in the Area of Distribution of Chalarodon Madagascariensis: Their Biological Implications,
W72-14144 2I

BLISS, L. C.
Oil and the Ecology of the Arctic,
W72-14188 5C

BLOCH, R.
Study of Poly (Methacrylates) and Poly (Urethanes) As Reverse Osmosis Membranes. Effect of Water Clustering on Transport Properties,
W72-14076 3A

BLUM, F. A.
Tunable Infrared Laser Spectroscopy of Atmospheric Water Vapor,
W72-13732 2B

BLUMER, M.
Oil Pollution: Persistence and Degradation of Spilled Fuel Oil,
W72-13810 5B

BOARDMAN, N. K.
Sensitive Fluorescence Method for the Determination of Chlorophyll a/Chlorophyll b Ratios,
W72-13796 5A

BOBB, W. H.
Model Studies of Outfall Systems for Desalination Plants (Part II - Estuary Models),
W72-14064 5B

BOCTOR, F. N.
A New Reagent for Detecting Tryptophan, Indole, and Indole-3-Acetic Acid in Thin-Layer Chromatography,
W72-13773 5A

BOEHMER, W. R.
Brown and Gray Sands on the Virginia Shelf: Color as a Function of Grain Size,
W72-14017 2J

BOGORODSKIY, V. V.
Physics of Freshwater Ice (Fizika presnovodnogo l'da),
W72-14037 2C

BOHN, H. L.
Sulfuric Acid: Its Potential for Improving Irrigation Water Quality,
W72-13920 5G

BOLAND, R. A. JR
Model Studies of Outfall Systems for Desalination Plants (Part II - Estuary Models),
W72-14064 5B

BOND, C. P.
The Quantimet 720P for Routine Biological Assay and Potency Calculation from Colony Count, Inhibition and Exhibition Zone Measurements,
W72-13762 5B

BONNET, C. W.
Records of Wells in Harris County, Texas, 1892-1972,
W72-14027 4B

BORNS, H. W. JR
Chronology of a Kettle-Hole Peat Bog, Cherryfield, Maine,
W72-14019 2J

BORTON, THOMAS E.
Symposium: Public Involvement in the Water Management Problems in the Great Lakes,
W72-13665 5C

BOTHNER, M. H.
Sorption-Desorption Reactions of Mercury with Suspended Matter in the Columbia River,
W72-13972 5B

BOUSH, G. M.
DDT: Inhibition of Sodium Chloride Tolerance by the Blue-Green Alga Anacystis Nidulans,
W72-13809 5C

BOWEN, V. T.
Concentrations and Distributions of Long-Lived Fallout Radionuclides in Open Ocean Sediments,
W72-13980 5B

BRADSPIES, J. I.
Anomalous Water,
W72-13842 1B

BRAIDECH, O.
Hypothesis for Dissolved Oxygen Depletion in the Central Basin Hypolimnion of Lake Erie,
W72-13659 5C

BRANSON, D. E.
Short-Time Deflections of Beams Under Single and Repeated Load Cycles,
W72-13749 8F

BRASHEAR, D. A.
Relative Resistance of Twenty Human Enteric Viruses to Free Chlorine in Potomac Water,
W72-13616 5F

BRESLER, E.
Soil Water Regime in Economic Evaluation of Salinity in Irrigation,
W72-13932 3C

BRID'KO, Y. I.
The Structural Composition and Water Stability of Podzolized Brown Forest Soils in the Krasnodar Territory, (In Russian),
W72-14178 2G

BRINGHAM, J. C.
California High Water, 1969-1970,
W72-14013 2E

BRINKHURST, RALPH O.
Symposium: Public Involvement in the Water Management Problems in the Great Lakes,
W72-13665 5C

BROMLEY, L. A.
Properties of Seawater and Its Concentrates and Related Solutions at Temperatures up to 400 Degrees F,
W72-14062 1B

BROOKS, A. L.
The Annual Cycle in Quantity and Composition of the Zooplankton of the Sargasso Sea Off Bermuda. II. The Surface to 2,000 m,
W72-13775 5B

BROWER, G. R.
Ozonation Reactions of Selected Pesticides for Water Pollution Abatement,
W72-13685 5G

BRUDER, K. F.
River Discharge into an Ice-Covered Ocean and Related Sediment Dispersal, Beaufort Sea, Coast of Alaska,
W72-14020 2J

BRUMMER, S. B.
Anomalous Water,
W72-13842 1B

BRUMO, G. W.
Interpretation of Tracer Tests on Sedimentation Tanks,
W72-13696 5D

BRUNE, D.
Neutron-Activation Determination of Vanadium in Oils and Catalysts,
W72-13804 5A

BRUNNER, P. G.
Permissible Activity Discharge into Receiving Waters Through Radioactive Waste Water from Nuclear Power Plants (Zulassige Aktivitatseinleitung in Vorfluter durch radioaktive Abwasser aus Kernkraftwerken),
W72-13987 5A

BRYDGES, T. G.
An Intensive Biochemical Survey of Western Lake Erie,
W72-13654 5C

BRYDGES, THOMAS G.
Chlorophyll a - Total Phosphorus Relationships in Lake Erie,
W72-13653 5C

BULL, W. B.
Prehistoric Near-Surface Subsidence Cracks in Western Freshno County, California,
W72-13717 2E

BUNGAY, H. R. III
Water Quality Predictions Based on Limnological Parameters,
W72-13825 5C

BURFORD, J. B.
Evaluation of a Deterministic Model for Predicting Water Yields from Small Agricultural Watersheds in Virginia,
W72-13824 2A

BURNETT, E. F. P.
Column Load Influence on Reinforced Concrete-Beam Column Connection,
W72-13748 8F

BURRELL, D. C.
Distribution Patterns for Some Particulate and Dissolved Trace Metals Within an Active Glacial Fjord,
W72-13973 5B

BURRIS, F. O. JR
Drying Cellulose Acetate Reverse Osmosis Membranes,
W72-14078 3A

BURTON, D. T.
A Re-Evaluation of the Anaerobic Endproducts of Freshwater Fish Exposed to Environmental Hypoxia,
W72-14093 5C

BUSCH, A. W.
Liquid Treating Apparatus,
W72-13878 5D

BUYERS, A. G.
A Study of Phosphate Induced Algal Growth in Order to Suppress or Eliminate this Phenomenon,
W72-13992 5A

BYKOV, V. N.
Effect of Pumping Freshwaters Into Oil Strata of the Perm Prikamje on the Distribution of Microflora, (In Russian),
W72-14135 5C

BYRNE, G. F.
An Improved Soil Water Flux Sensor,
W72-14192 7B

CALAWA, A. R.
Tunable Infrared Laser Spectroscopy of Atmospheric Water Vapor,
W72-13732 2B

CAMERON, ELIZABETH
Studies on Anuran Water Balance: II. Desiccation in the Australian Frog, Notaden Bennetti,
W72-14133 2I

CANNON, J. E.
Report for the 12 Month Period July 1, 1970-June 30, 1971,
W72-14051 5A

CANTOR, P. A.
Biological Degradation of Cellulose Acetate Reverse Osmosis Membranes,
W72-14079 3A

CAPENER, T.
Wheeler-Dealing: Jackpot in Hay,
W72-13921 3F

CARCICH, I. G.
Phosphorus in Wastewater,
W72-14046 5B

CARPENTER, R.
Sorption-Desorption Reactions of Mercury with Suspended Matter in the Columbia River,
W72-13972 5B

CARTER, H. H.
Design and Siting Criteria for Once-Through Cooling Systems Based on a First-Order Thermal Plume Model,
W72-14030 5C

CASE, C. M.
Transformation of the Tensor Form of Darcy's Law in Inhomogeneous and Anisotropic Soils,
W72-14055 2F

CHALMERS, A.
Small Diameter Sand Drains,
W72-13756 8D

CHAMBOREDON, R.
Littoral Oniscoids from the Thau Basin (Mediterranean Littoral Pond): Faunistic and Ecological Study (In French),
W72-14166 2H

CHAN, W. B.
California High Water, 1969-1970,
W72-14013 2E

CHANIOTIS, B. N.
Natural Population Dynamics of Phlebotomine Sandflies in Panama,
W72-14147 2I

CHARLES, F.
Distribution of Chlorophyll and Its Relation to Particulate Organic Matter in the Offshore Waters of Lake Michigan,
W72-13648 5C

CHAUHAN, K. S.
Effect of Moisture Stress and Indolebutyric Acid on Rooting of Stem Cuttings of Pomegranate (Punica Granatum L.),
W72-14123 3F

CHENEY, A. H.
Distillation Apparatus for Desalinisation of Saline Water to Recover Fresh Water as Condensate,
W72-13897 3A

CHERKAUER, D. S.
Longitudinal Profiles of Ephemeral Streams in Southeastern Arizona,
W72-14021 2E

CHEW, K. K.
Mortality of Pacific Oysters (Crassotrea GI-Gas): The Influence of Temperature and Enriched Seawater on Oyster Survival,
W72-13875 5C

CHITTENDEN, M. E. JR
Salinity Tolerance of Young Blueback Herring, Alosa Aestivalis,
W72-13870 5C

CHOW, V. T.
Theory of Stochastic Modeling of Watershed Systems,
W72-14007 2A

CHREKIAN, G. P.
An Automated Liquid Chromatographic Method for the Determination of Tetracycline Antibiotics,
W72-13669 5A

CHRISTAL, C. Q.
Oil Pollution of the Marine Environment - A Legal Bibliography,
W72-13904 5G

CHUBARINA, YE. V.
Electricity of Clouds,
W72-14039 2B

CICCHETTI, C. J.
Recreation Benefit Estimation and Forecasting: Implications of the Identification Problem,
W72-13934 6A

CLARK, S. H. B.
Growth of a Talus Cone in the Western Chugach Mountains, Alaska,
W72-14026 2J

CLARKE, N. A.
The Coliform Test: A Criterion for the Viral Safety of Water,
W72-13612 5F

CLIVER, D. O.
Viruses in Water and Wastewater: Effects of some Treatment Methods,
W72-13614 5F

COCHRAN, G. F.
Transformation of the Tensor Form of Darcy's Law in Inhomogeneous and Anisotropic Soils,
W72-14055 2F

COETZEE, J. F.
Voltammetry in Methanol, Ethanol, and Sulfolane as Solvents,
W72-13794 5A

COLBY, B. N.
On-Line Computer-Controlled Electrical Detection in Spark Source Mass Spectrometry,
W72-13770 7B

Precision of Electrical Detection Measurements of Powdered Samples in Spark Source Mass Spectrometry,
W72-13787 5A

COLE, E. L.
Treatment of Waste Liquors from Pulp and Paper Mills,
W72-13896 5D

COLENBRANDER, H. J.
The Use of Geohydrology in Solving Water Management Problems in Agriculture,
W72-13726 4B

COLLIS-GEORGE, N.
Infiltration and Structural Changes as Influenced by Initial Moisture Content,
W72-14196 2G

CONNOR, DESMOND,
Symposium: Public Involvement in the Water Management Problems in the Great Lakes,
W72-13665 5C

COOKE, G. D.
A Quantitative Comparison of Pigment Extraction by Membrane and Glass-Fiber Filters,
W72-13673 5A

COPELAND, B. J.
Esturine Ecosystems and High Temperatures,
W72-13636 5C

CORDONNIER, P.
Seasonal Variations in the Avifauna Composition of the Lavours Swamp (AIN),
W72-13799 2I

CORREA, M. A.
Natural Population Dynamics of Phlebotomine Sandflies in Panama,
W72-14147 2I

COSTA, R.
Efficiency of Sucrose Flotation in Recovering Insect Larvae From Benthic Stream Samples,
W72-14116 2I

COSTIN, L.
The Removal of Coxsackie Virus from Water by Sand Obtained from the Rapid Sand Filters of Water-Plants,
W72-14156 5F

CRAWLEY, J. A.
The Quantimet 720P for Routine Biological Assay and Potency Calculation from Colony Count, Inhibition and Exhibition Zone Measurements,
W72-13762 5B

CRESKOFF, J. J.
Vacuum Distillation Process and Apparatus with Direct Air Contact Condensing for Desalination of Water,
W72-13882 3A

CREWS, T. W.
A Study of Light Attenuation in Monterey Bay, California,
W72-13798 5A

CRONIN, W. B.
Suspended Sediment Data Summary March 1966-May 1967, Upper Chesapeake Bay (Tolchester to Havre De Grace),
W72-13849 2L

CURTIS, M. L.
Detection and Measurement of Tritium by Bremsstrahlung Counting,
W72-13679 5A

DA COSTA, E. W. B.
Variation in the Toxicity of Arsenic Compounds to Microorganisms and the Suppression of the Inhibitory Effects by Phosphate,
W72-13813 5C

DAMELIN, E.
Engineering and Economic Evaluation of the Reliability of Water Supply,
W72-13936 6D

DANDY, J. W. T.
Activity Response to Chlorine in the Brook Trout, Salvelinus Fontinalis (Mitchell),
W72-13867 5C

DAVIES, P. A.
Contamination of Lettuce Irrigated with Sewage Effluent,
W72-14104 5B

DAVIS, H. LEE
Esturine Ecosystems and High Temperatures,
W72-13636 5C

DAWKINS, M. E.
Some Aspects of Effluent Landspreading,
W72-13712 5D

DE VRIES, J. J.
Buried Channel Aquifers and Present Open Drainage System of East Gelderland, The Netherlands,
W72-13722 2F

DEEVEY, G. B.
The Annual Cycle in Quantity and Composition of the Zooplankton of the Sargasso Sea Off Bermuda. II. The Surface to 2,000 m,
W72-13775 5B

DEGA, C. A.
Growth of Salmonella Typhimurium in Skim Milk Concentrates,
W72-13818 5A

DEHAVEN, C. G.
Operation of Reverse Osmosis Pilot Plants,
W72-14074 3A

DEJOU, J.
The Main Physico-Chemical Characteristics of Soils of the Vertisal and Sodium-Containing Type in the Rochefort Marsh at St-Laurent-De-La-Pree (Maritime Charente, France),
W72-14190 2G

DEKOROSY, F.
Influence of Strongly Bound Counter-Ions on Permselective Membranes,
W72-14073 3A

DESCHIENS, R.
Epidemiological and Ecological Aspects Due to the Construction of River Weirs in the Tropical Regions,
W72-13819 5C

DINAN, F. J.
Concentration of Mercury in the Manufacture of Fish Protein Concentrate by Isopropyl Alcohol Extraction of Sheepshead and Carp,
W72-13869 5C

DOBRETSENI, B.
Problems of Interaction of Mineral Fertilizers and Irrigation on Certain Types of Hungarian Soils, (In Russian),
W72-14172 3F

DODGSON, P. T.
Chemical Treating Process for Sewage Systems,
W72-13899 5D

DONOHO, A. L.
Determination of Diethylstilbestrol in Cattle Tissues,
W72-13677 5A

DORNEANU, A.
Yield and Water Consumption of the Plants Grown in Pots as Influenced by Soil Structure, (In Rumanian),
W72-14173 2G

DOROKHOV, M. M.
Equipping Structures of Hydroelectric Power Stations with Measuring Devices for Monitoring Percolation,
W72-13758 8D

DOSMUKHAMEDOV, T. K.
Soil Erosion Studies in the Presnovskii Sovkhoz in the Pavlodar Oblast, (In Russian),
W72-14171 2J

DOUGLAS, A. S.
Study of Poly (Methacrylates) and Poly (Urethanes) As Reverse Osmosis Membranes. Effect of Water Clustering on Transport Properties,
W72-14076 3A

DRAYCOTT, A. P.
Effects of Cultural Practices and Fertilizers on Sugar Beet Quality,
W72-14139 5C

DREKWING, F. J.
Comprehensive Abatement Program for an Eutrophic Lake,
W72-13663 5C

DREWRY, W. A.
Virus Rem Oval by Chemical Coagulation,
W72-13684 5D

DUBOIS, R. N.
Inverse Relation Between Foreshore Slope and Mean Grain Size as a Function of the Heavy Mineral Content,
W72-14016 2J

DUGAN, P. R.
Chlorinated Hydrocarbon, Microparticulate Effects on Microorganisms Isolated from Lake Erie,
W72-13999 5C

DURKEE, E. L.
Reverse Osmosis System,
W72-13879 3A

DURRANT, M. J.
Effects of Cultural Practices and Fertilizers on Sugar Beet Quality,
W72-14139 5C

DUTHIE, H. C.
Evidence for the Eutrophication of Lake Ontario from the Sedimentary Diatom Succession,
W72-13641 5C

DUTIL, P.
The Soils of the Wooded District of the Southeastern Morne Department: Soil Formation and General Data on Water Management,
W72-13918 2G

DZHANPEISOV, R.
Erosion-Ameliorative Investigations of Soils in Kazakhstan, (In Russian),
W72-14174 4D

EAGLESON, P. S.
Dynamics of Flood Frequency,
W72-14003 2E

EDGINGTON, H. C.
Optimization of Dissolved Oxygen Measurements,
W72-14066 5A

EDWARDS, D. G. W.
The Kinetics of Water Absorption in Stratifying and Nonstratifying Noble Fir (Abies Procera Rehd.) Seeds,
W72-14099 2I

EIDMAN, V. R.
Economic Efficiency in the Allocation of Irrigation Water Over Time,
W72-13823 6B

EIJPE, R.
Permeability Distribution in a Holocene Distributary Channel-Fill Near Leerdam (The Netherlands),
W72-13730 2J

EILER, H. O.
Drought Resistance in Subalpine Nymphs of Somatochlora Semicircularis Solys (Odonata: Corduliidae),
W72-14183 2I

EISA, H. M.
Controlled-Environment Vegetable Production: Results of Trials at Puerto Penasco, Mexico, 1968-1970,
W72-13926 3F

EL ABBASERI, M.
Effect of Land use Period on Soil Properties,
W72-13922 2G

EL-ALEEM, A. A.
Reproduction of Tilapia Nilotica L,
W72-14042 8I

Tilapia Fishery in Lake Maruit: Age and Growth of Tilapia Nilotica L. In The Lake,
W72-14000 2H

EL-GHAMRY, W. M.
Water and Some Nutrients Losses by Deep Percolation as Influenced by the Depth of Water Table,
W72-13923 2G

EL-SEDFY, H. M.
The Biology and Fishery of Mugil Saliens (Risso) in Lake Quarun, U. A. R.,
W72-14107 2H

EL-ZARKA, S.
Reproduction of Tilapia Nilotica L,
W72-14042 8I

Tilapia Fishery in Lake Maruit: Age and Growth of Tilapia Nilotica L. In The Lake,
W72-14000 2H

EL-ZARKA, SALAH
The Biology and Fishery of Mugil Saliens (Risso) in Lake Quarun, U. A. R.,
W72-14107 2H

ELLIS, W. D.
Versatile Colorimetric Coulometer,
W72-13802 2K

ELY, N.
Authorization of Federal Water Projects (Final Report, Draft Review),
W72-13957 6B

ENDRES, G. W. R.
Concentrations of Zinc-65 in Marine Foodstuffs and Pacific Coastal Residents,
W72-13979 5B

ENTINE, G.
Anomalous Water,
W72-13842 1B

ERFLE, P. D.
Roughness Elements as Energy Dissipators of Free-Surface Flow in Circular Pipes,
W72-13747 8B

ESSIG, T. H.
Concentrations of Zinc-65 in Marine Foodstuffs and Pacific Coastal Residents,
W72-13979 5B

FAITHFULL, N. T.
Variation of Precision with Time for Autoanalyzer Data,
W72-13763 7B

FATHI, A.
Effect of Land use Period on Soil Properties,
W72-13922 2G

FAULKNER, L. R.
Characterization of Gas Chromatographic Effluents Via Scanning Fluorescence Spectrometry,
W72-13672 5A

FELDT, L. E.
Phytoplankton Assemblage Differences at Inshore Versus Offshore Stations in Lake Michigan, and Their Effects on Nutrient Enrichment Experiments,
W72-13650 5C

FELDT, LAURIE E.
Nutrients, Phytoplankton Productivity and Species Composition as Influenced by Upwelling in Lake Michigan,
W72-13649 5C

FENLON, M. W.
Influences of Thermal Effluents Upon Aquatic Production in Lake Ontario,
W72-13642 5C

FERRELL, R. E.
The Genesis of Selected Hydrochemical Facies in Baton Rouge, Louisiana, Ground Waters,
W72-14008 2F

FETTEROLF, CARLOS M. JR
Radioactivity in Lake Michigan Water and Biota Vicinity of Big Rock Point Nuclear Reactor, 1960-69,
W72-13656 5C

FFOLLIOTT, P. F.
Development of Forest Management Practices for Increasing Snowpack Water Yield,
W72-13995 2C

Use of Forest Attributes in Snowpack Inventory - Prediction Relationships for Arizona Ponderosa Pine,
W72-13996 2C

FILIPIUC, M.
The Effect of Certain Chlorinated Organic Pesticides on Hygienic Indicators of Water,
W72-14164 5C

FISCHER, Z.
The Elements of Energy Balance in Grass Carp (CtenopharyngodonIdella Val.): I,
W72-13815 2I

FITZGERALD, H. J.
Oil Skimming Apparatus,
W72-13894 5G

FOLEY, N. L.
Distillation Apparatus for Desalinisation of Saline Water to Recover Fresh Water as Condensate,
W72-13897 3A

FOLSOM, T. R.
Mussels and Barnacles as Indicators of the Variation of Manganese-54, Cobalt-60 and Zinc-65 in the Marine Environment,
W72-13978 5B

FORD, R. H.
Seedbed Preparation and Seeding Methods to Establish Grassed Waterways,
W72-13914 4A

FORDHAM, J. W.
Streamflow Synthesis -- A Case Study,
W72-14005 2A

FOSTER, H. L.
Growth of a Talus Cone in the Western Chugach Mountains, Alaska,
W72-14026 2J

FOWLER, M. G.
Four-Dimensional World-Wide Atmospheric Models (Surface to 25 Km Altitude),
W72-13843 2B

FOX, F. K.
New Pipe Configuration Reduces Wall Sticking,
W72-13633 8A

FOX, J. E. JR
Use of Chemicals to Maintain Clear Water for Drilling,
W72-13628 8C

FRANCIS, S. A.
Apparatus for Measuring Properties of a Fluid Body from an Airborne Vehicle,
W72-13876 7B

FREA, J. I.
Chlorinated Hydrocarbon, Microparticulate Effects on Microorganisms Isolated from Lake Erie,
W72-13999 5C

FREA, JAMES I.
Effect of Mineral Particulates on Microbial Degradation of Solid Organic Materials,
W72-13645 5C

FREDERICKS, A. D.
The Geochemistry of Radiocarbon in the Gulf of Mexico,
W72-13981 5B

FREED, D. J.
Characterization of Gas Chromatographic Effluents Via Scanning Fluorescence Spectrometry,
W72-13672 5A

FRENCH, J. J.
Ground-Water Outflow from Chino Basin, Upper Santa Ana Valley, Southern California,
W72-13838 2F

FRENCH, K. H. V.
Gas Liquid Chromatographic Analysis of Hydrocarbon Mixtures. A Report on the Work of the International Conference of Benzole Producers,
W72-13771 5A

FRIEDMAN, L.
Chronic Exposure of Rats to Methyl Mercury in Fish Protein,
W72-13780 5C

FRUH, E. G.
Nutrient Studies in Texas Impoundments,
W72-13692 5C

FUKUOKA, Y.
Relation of Precipitation to Soil Temperature (2nd Report)--Effect of Soil Moisture on Heat-Exchange in the Soil,
W72-13845 2G

GABRYSCH, R. K.
Records of Wells in Harris County, Texas, 1892-1972,
W72-14027 4B

GALE, N. L.
Research on Ion Transport Across Microbial Membranes,
W72-14084 3A

GALLUS, J. P.
Use of Chemicals to Maintain Clear Water for Drilling,
W72-13628 8C

GALTIN, C.
Two-Dimensional Study of Rock Breakage in Drag-Bit Drilling at Atmospheric Pressure,
W72-13625 8C

GANGULY, A. K.
Anomalous Th228/Th232 and Th230/232 Activity Ratios in Backwater Sediments Along the West Coast of India.
W72-13982 5B

GANNON, JOHN E.
The Decline of the Large Zooplankter, Limnocalanus Macrurus Sars (Copepoda: Calanoida), in Lake Erie,
W72-13643 5C

GASIEWICZ, T. A.
Concentration of Mercury in the Manufacture of Fish Protein Concentrate by Isopropyl Alcohol Extraction of Sheepshead and Carp,
W72-13869 5C

GATES, DAVID M.
Man and His Environment: Climate,
W72-14137 6G

GATLIN, C.
How Rotary Speed and Bit Weight Affect Rotary Drilling Rate,
W72-13631 8C

GAYE, F.
Efficient Excavation,
W72-13746 8H

GEDNEY, R. T.
Effect of Eddy Diffusivity on Wind-Driven Currents in a Two-layer Stratified Lake,
W72-14010 2H

GEHRING, PHILIP E.
Hypothesis for Dissolved Oxygen Depletion in the Central Basin Hypolimnion of Lake Erie,
W72-13659 5C

GEIKE, F.
Thin-Layer Chromatographic-Enzymatic Identification of Some Lindane- and Possible DDT-Metabolites as well as Pentachlorophenol, (Dunnschichtchromatographisch-Enzymatischer Nachweis Einiger Lindan-Und Theoretisch Moglicher DDT-Metaboliten Sowie Von Pentachlorphenol),
W72-13760 5A

GELBLUM, G. P.
Direct Contact Desulfation Laboratory and Pilot Plant Development Study for Softening of Sea Water,
W72-14065 3A

GELDREICH, E. E.
The Coliform Test: A Criterion for the Viral Safety of Water,
W72-13612 5F

GERE, G.
Studies on the Course of Litter Decomposition in a Hungarian Quercetum-Petraeae-Cerris Forest Stand,
W72-14165 4A

GHOWAL, S. I.
Water and Some Nutrients Losses by Deep Percolation as Influenced by the Depth of Water Table,
W72-13923 2G

GIANG, P. A.
Sandwich KBr Disk for Scanning Volatile Pesticides,
W72-13811 5A

GILLS, T. E.
Method for Determination of Mercury in Biological Materials by Neutron Activation Analysis,
W72-13788 5A

GILMOUR, D. A.
A Hand-Augering Method of Installing Access Tubing for Neutron Moisture Meters,
W72-14194 7B

GIORDANI-SOIKA, A.
On Some Modifications in the Venetian Climate During the Last Thirty Years: Repercussions of the Phenomenon of Flood Waters,
W72-13757 2B

GISSER, M.
An Integration of the Agricultural Demand Function for Water and the Hydrologic Model of the Pecos Basin,
W72-13993 6D

GITIN, E. L.
Evaluation of the Hypoiodous Iodine Tablet - Phase II,
W72-13701 5F

GJESSING, E. T.
Effect of pH on the Filtration of Aquatic Humus Using Gels and Membranes,
W72-13681 5A

GLASER, O.
Chronic Exposure of Rats to Methyl Mercury in Fish Protein,
W72-13780 5C

GLENN, M. T.
Studies on the Determination of Physiological Levels of Chromium in Serum by Gas Chromatography,
W72-13767 5A

GLOOSCHENKO, WALTER A.
The Effect of DDT and Dieldrin Upon C-14 Uptake by in Situ Phytoplankton in Lakes Erie and Ontario,
W72-13657 5C

GLOTFELTY, D. E.
Identification of Organochlorine Pesticide Residues by Ultraviolet Solid-Phase Photolysis,
W72-13786 5A

GLOYNA, E. F.
Process Modeling of Biological Waste Treatment,
W72-13694 5D

GODEANU, S.
Data on the Ecology and Geographical Distribution of the Testaceans of the Area of the Future Dam Lake at Iron Gate,
W72-13755 2I

GOEPFERT, J. M.
Growth of Salmonella Typhimurium in Skim Milk Concentrates,
W72-13818 5A

GOINS, W. C. JR
Design and Operation of Jet-Bit Programs for Maximum Hydraulic Horsepower, Impact Force or Jet Velocity,
W72-13626 8C

GOLDBERG, D.
The Effect of Distance from the Tricklers on Soil Salinity and Growth and Yield of Sweet Corn in an Arid Zone,
W72-14105 3F

Emergence, Early Growth, and Salinity of Five Vegetable Crops Germinated by Sprinkle and Trickle Irrigation in an Arid Zone,
W72-14106 3F

Sprinkle and Trickle Irrigation of Green Pepper in an Arid Zone,
W72-14089 3F

Sprinkle, Furrow and Trickle Irrigation of Muskmelon in an Arid Zone,
W72-14090 3F

GOLDNER, B. H.
Research on Ion Transport Across Microbial Membranes,
W72-14084 3A

GOLDSTEIN, H.
Method for Preventing Water Loss from Reservoirs and Channels,
W72-13889 4A

GOLOMB, A.
An Example of Economic Plating Waste Treatment by Reverse Osmosis,
W72-13687 5D

GOODENOUGH, R. D.
Process for Treating Water with a Polyhalide Resin Using a Semipermeable Membrane Barrier,
W72-13887 5F

GORDON, J. D.
Development of Ground Water in the El Paso District, Texas, 1963-70,
W72-14029 2F

GORDON, L. K.
Certain Features of Respiratory Metabolism of Plants Under Conditions of an Increasing Water Deficiency, (In Russian)
W72-14195 3F

GRAHAM, J. W.
Analytical Determination of Optimum Bit Weight and Rotary Speed Combinations,
W72-13619 8C

GRANT, J. P.
Delayed Yield and Unsaturated Flow Above a Falling Water Table,
W72-14052 2G

GRAVEL, YVON
The Ichthyofauna and Flora of Lake St. Louis on the St. Lawrence River Near Montreal, Quebec: General Features and Recent Changes,
W72-13647 5C

GRAVES, G.
Extensions of Mathematical Programming for Regional Water Quality Management,
W72-13931 5G

GRAY, G. R.
Plan the Mud Program to Reduce Exploration Cost,
W72-13620 8A

GRAY, J. S.
Seasonal Variation of the Suspended Solid Matter, Off the Coast of North Yorkshire,
W72-13682 5B

GRAY, K. E.
Two-Dimensional Study of Rock Breakage in Drag-Bit Drilling at Atmospheric Pressure,
W72-13625 8C

GREEN, B. Q.
Which Lost-Circulation Materials to Use ... And How to Use Them,
W72-13621 8G

GREENE, F. T.
An Experimental Study of the Structure, Thermodynamics and Kinetic Behavior of Water,
W72-14060 1B

GREENHOOD, E. C.
Fish and Wildlife in the Marine and Coastal Zone, Part A, Summary Planning Information, and Recommendations,
W72-13908 6G

GREESON, P. E.
Limnology of Oneida Lake with Emphasis on Factors Contributing to Algal Blooms,
W72-13851 5C

GREGOR, H. P.
Continuing Development of a General Mechanistic Theory of Membrane Phenomena and Continuing Experimental and Theoretical Studies of Ion-Exchange Polarization Phenomena,
W72-14085 3A

GRENNESS, M.
Semiintegral Electroanalysis: Theory and Verification,
W72-13791 2K

GREVE, P. A.
Endosulfan in the Rhine River,
W72-13847 5C

The Persistence of Endosulfan in Surface Water,
W72-14193 5B

GROSS, D. L.
Geologic Cross Sections Derived from Seismic Profiles and Sediment Cores from Southern Lake Michigan,
W72-13844 2J

GUMINSKA, B.
Sarcosphaera Eximia (Dur. et Lev.) R. Mre. in the Pieniny National Park,
W72-13909 2I

GUNAJI, N. N.
Disposal of Brine by Solar Evaporation,
W72-14077 2D

GUPTA, V. L.
Streamflow Synthesis -- A Case Study,
W72-14005 2A

GUR-ARIE, EITAN
A Turbulent Flow Theory of Electrodialysis,
W72-14061 3A

GUSEV, A. V.
Physics of Freshwater Ice (Fizika presnovodnogo l'da),
W72-14037 2C

GUTENTAG, E. D.
Ground Water in Kearny County, Southwestern Kansas,
W72-13715 7C

GUYOT, J.
The Main Physico-Chemical Characteristics of Soils of the Vertisal and Sodium-Containing Type in the Rochefort Marsh at St-Laurent-De-La-Pree (Maritime Charente, France),
W72-14190 2G

GUZE, L. B.
Osmotic Stability and Sodium and Potassium Content of L-Forms of Streptococcus Faecalis,
W72-13764 5C

GYURKO, S.
Aspects of the Nutritive Dynamics and Trophic Relationships of the Burbot (Lota Lota Lota L.) in the Upper Mures River, (In Rumanian),
W72-14127 2H

HAAHTI, E.
New Methods for Detection and Quantification in Thin-Layer Chromatography: A Study of Pyrolysis and Combustion Systems,
W72-13768 5A

HACH, C. C.
Method and Means for Detecting Coliform Bacteria in Water,
W72-13881 5A

HADEN, E. L.
Techniques for Preventing Differential-Pressure Sticking of Drill Pipe,
W72-13618 8C

HADLAND, C. M.
Patterns of Lakeshore Usage Around Lake Bemidji,
W72-14131 5C

HAFLEY, W. L.
Effects of Land Use on Municipal Watersheds,
W72-13759 4C

HAIMES, Y. Y.
A Multilevel Approach to Determining Optimal Taxation for the Abatement of Water Pollution,
W72-13935 5G

HAIRE, W. J.
Flooding Along the Rio Piedras in the San Juan Area, Puerto Rico,
W72-13714 7C

HALBERG, H. N.
Use of Water in Arkansas, 1970,
W72-14028 6D

HALL, H. N.
Ability of Drilling Mud to Lift Bit Cuttings,
W72-13629 8B

HAMMER, T. R.
Procedures for Estimating the Hydrologic Impact of Urbanization,
W72-14002 4C

HANDY, R. L.
Alluvial Cutoff Dating from Subsequent Growth of a Meander,
W72-14025 2J

HANSEN, P.
The Effect of Fruiting Upon Transpiration Rate and Stomatal Opening in Apple Leaves,
W72-14097 3F

HARAM, O. J.
Some Observations on the Food of the Gwyniad Coregonus Clupeoides pennantii Valenciennes of Llyn Tegid (Lake Bala), North Wales,
W72-13738 2H

HARJAI, S. C.
Effect of Soil Moisture on the Phase Characters of Hatchlings in the Desert Locust, Schistocerca Gregaria Forsk,
W72-14092 2I

HARMAN, T. C.
Tunable Infrared Laser Spectroscopy of Atmospheric Water Vapor,
W72-13732 2B

HARRINGTON, F. A.
Fluid Separation,
W72-13890 5G

HARRIS, R. P.
Horizontal and Vertical Distribution of the Interstitial Harpacticoid Copepods of a Sandy Beach,
W72-13783 5C

HAY, R. L.
Weathering of Basaltic Tephra on the Island of Hawaii,
W72-14014 2J

HAYS, H.
Pollutant Concentrations in Abnormal Young Terns from Long Island Sound,
W72-14134 5C

HEATWOLE, HAROLD
Studies on Anuran Water Balance: II. Desiccation in the Australian Frog, Notaden Bennetti,
W72-14133 2I

HEDMAN, E. R.
Selected Streamflow Characteristics as Related to Channel Geometry of Perennial Streams in Colorado,
W72-13736 2E

HEIDINGER, R. C.
Use of Ultraviolet Light to Increase the Availablity of Aerial Insects to Caged Bluegill Sunfish,
W72-14140 2I

HEIL, R. W.
Method and Apparatus for Use in the Activated Sludge Treatment of Sewage,
W72-13901 5D

HEISTAND, R. N.
Titrimetric Determination of Trace Sulfur in Petroleum Using a Lead Ion Selective Electrode,
W72-13806 5A

HELMICK, W. E.
Pressure-Differential Sticking of Drill Pipe and How it Can be Avoided or Relieved,
W72-13630 8C

HEM, J. D.
Chemical Factors that Influence the Availability of Iron and Manganese in Aqueous Systems,
W72-14022 5B

HENDERSON, W.
Rapid Method for Detection and Characterization of Steroids,
W72-13781 5A

HENNIGAN, JOHN J. JR
Comprehensive Abatement Program for an Eutrophic Lake,
W72-13663 5C

HERAK, M. J.
Solvent Extraction and Separation of Zirconium, Niobium and Tantalum by 2-Carbethoxy-5-Hydroxy-1- (4-Tolyl)-4-Pyridone,
W72-13807 5A

HERMANN, F. A. JR
Model Studies of Outfall Systems for Desalination Plants (Part II - Estuary Models),
W72-14064 5B

HESS, H. V.
Treatment of Waste Liquors from Pulp and Paper Mills,
W72-13896 5D

HETLING, L. J.
Phosphorus in Wastewater,
W72-14046 5B

HILL, A. J.
A Device for Measuring and Recording the Amount and Duration of Free Water on Vegetation in the Field,
W72-14094 3F

HILL, L. G.
Osmotic Acclimation in the Red River Pupfish, Cyprinodon rubrofluviatilis,
W72-13680 2I

HILL, W. F. JR
Enteric Viruses in Ground and Surface Waters: A Review of their Occurrence and Survival,
W72-13611 5F

HIMMELBLAU, D. M.
Process Modeling of Biological Waste Treatment,
W72-13694 5D

HIRANO, S.
On The Physico-Chemical Behavior of Radioactive Cerium in Sea Water,
W72-13970 5B

HOFFMAN, G. O.
Declaring War....On Mesquite,
W72-13925 3B

HOFFMAN, H. W.
Performance Characteristics of Advanced Evaporator Tubes for Long-Tube Vertical Evaporators (An Addendum),
W72-14068 3A

HOLETON, G. F.
Respiratory and Circulatory Responses of Rainbow Trout Larvae to Carbon Monoxide and to Hypoxia,
W72-14146 5C

HOLMQUIST, C.
Northerly Localities for Three Aquatic Plants, Lemna Trisulca L., Ceratophyllum Demersum L., and Myriophyllum Spicatum L.,
W72-14141 2I

HOLT, C. S.
Patterns of Lakeshore Usage Around Lake Bemidji,
W72-14131 5C

HONDA, Y.
Studies on the Behaviours and Distribution of Radioactive Substances in Coastal and Estuarine Waters,
W72-13976 5B

HONSTEAD, J. F.
Concentrations of Zinc-65 in Marine Foodstuffs and Pacific Coastal Residents,
W72-13979 5B

HOOPES, J. A.
Unsteady Flow of Ground Water,
W72-14053 2F

HORANIC, G. E.
A Device for Measuring and Recording the Amount and Duration of Free Water on Vegetation in the Field,
W72-14094 3F

HORSFALL, W. R.
Eggs of Floodwater Mosquitoes: XIV. Northern Aedes (Diptera: Culicidae),
W72-14115 2I

HORTENSTINE, C.
Plants and Wastewater Renovation,
W72-13707 5D

HOWARD, G. C.
An Analysis and the Control of Lost Circulation,
W72-13627 8B

HUANG, V. H.
Nutrient Studies in Texas Impoundments,
W72-13692 5C

HUBBS, C.
Competition and Isolation Mechanisms in the Gambusia Affinis X G. Heterochir Hybrid Swarm,
W72-13718 8H

HUBER, C. O.
Wax-Bound Lead Dioxide Potentiometric Electrode and Applications to Chelometric Titration,
W72-13676 5A

HUBERT, E. G.
Osmotic Stability and Sodium and Potassium Content of L-Forms of Streptococcus Faecalis,
W72-13764 5C

HUCKLE, H. F.
Soil Suitability for Spray Irrigation,
W72-13706 5D

HUGHES, F. H.
Small Diameter Sand Drains,
W72-13756 8D

HUMENIK, F. J.
Swine Waste Characterization and Evaluation of Animal Waste Treatment Alternatives,
W72-13635 5D

HUNT, R. L.
Responses of a Brook Trout (Salvelinus Fontinalis) Population to Habitat Development in Lawrence Creek,
W72-14108 8I

HUNTZINGER, T. L.
Future Water Use Model of Utah Valley,
W72-13928 4A

HURST, N.S.
Evaluation of the Hypoiodous Iodine Tablet - Phase II,
W72-13701 5F

HUSAR, M. A. JR
A Multilevel Approach to Determining Optimal Taxation for the Abatement of Water Pollution,
W72-13935 5G

IL'ENKO, A. I.
Regularities of Sr90 and Cs137 Circulation in Different Links of Food Chain in Zoocoenosis,
W72-13801 5B

IMYANITOV, I. M.
Electricity of Clouds,
W72-14039 2B

INGRAM, H. T.
Method for Preventing Water Loss from Reservoirs and Channels,
W72-13889 4A

IN'T VELD, R. A.
A Technique for Curie Point Pyrolysis Gas Chromatography of Complex Biological Samples,
W72-13761 5A

IRWIN, G. A.
Limnological Studies of Big Bear Lake, California,
W72-13739 5C

Water-Quality Reconnaisance of the Lower Santa Ana River Canyon, Southern California,
W72-13720 2K

IVANOV, A. D.
Water Erosion of Soils on the Right Bank of the Selenga River, (In Russian),
W72-14175 2J

JANKO, M.
Solvent Extraction and Separation of Zirconium, Niobium and Tantalum by 2-Carbethoxy-5-Hydroxy-1- (4-Tolyl)-4-Pyridone,
W72-13807 5A

JARVIS, M. A.
Operation of Reverse Osmosis Pilot Plants,
W72-14074 3A

JELLINEK, H. H. G.
Complexation of Metal Ions with Natural Polyelectrolytes (Removal and Recovery of Metal Ions from Polluted Waters),
W72-13776 5A

JENSEN, B. L.
Life History and Ecology of the Gizzard Shad, Dorosoma Cepedianum (Le Sueur) With Reference to Elephant Butte Lake,
W72-13927 2H

JENSEN, M. H.
Controlled-Environment Vegetable Production: Results of Trials at Puerto Penasco, Mexico, 1968-1970,
W72-13926 3F

JERIS, J. S.
Biological Denitrification Using Fluidized Granular Beds,
W72-14047 5D

JESTER, D. B.
Life History and Ecology of the Gizzard Shad, Dorosoma Cepedianum (Le Sueur) With Reference to Elephant Butte Lake,
W72-13927 2H

JOHNSON, K. M.
Natural Population Dynamics of Phlebotomine Sandflies in Panama,
W72-14147 2I

JOHNSON, L. D.
Growth of Known Age Muskellunge (Esox Masquinongy) in Wisconsin and Validation of Age and Growth Determination Methods,
W72-14110 2I

JOHNSON, L. G.
Pesticide and Mercury Levels in Migrating Duck Populations,
W72-13865 5C

JOHNSON, W. S.
Determination of Diethylstilbestrol in Cattle Tissues,
W72-13677 5A

JONES, B. F.
Weathering of Basaltic Tephra on the Island of Hawaii,
W72-14014 2J

JONES, D. A.
A New Light Trap for Plankton,
W72-13797 5A

JONES, J. W.
Some Observations on the Food of the Gwyniad Coregonus Clupeoides pennantii Valenciennes of Llyn Tegid (Lake Bala), North Wales,
W72-13738 2H

JONES, M. B.
Studies on the Mechanisms of Action of the Antitranspirant Phenylmercuric Acetate, and its Penetration into the Mesophyll,
W72-14149 2I

JORDAN, R. R.
Geology and Ground Water, University of Delaware, Newark, Delaware,
W72-13833 4B

JOSHI, O. U.
Anomalous Th228/Th232 and Th230/232 Activity Ratios in Backwater Sediments Along the West Coast of India.
W72-13982 5B

JOSHI, S. R.
2-Amino-4-Methylthiazole as a Reagent for the Gravimetric Determination and Extraction of Mercury (II),
W72-13812 5A

JOVANOVIC, D. A.
Co-precipitation Applied in the Determination of Lead in Drinking Water, (In Serbo-Croatian),
W72-14179 5A

KALMANSON, G. M.
Osmotic Stability and Sodium and Potassium Content of L-Forms of Streptococcus Faecalis,
W72-13764 5C

KANDIL, M. F.
Effect of Land use Period on Soil Properties,
W72-13922 2G

KAPLAN, M. A.
A Multilevel Approach to Determining Optimal Taxation for the Abatement of Water Pollution,
W72-13935 5G

KARANIK, JOHN M.
Comprehensive Abatement Program for an Eutrophic Lake,
W72-13663 5C

KAREEV, A. S.
A Radiation Mole Flow-Moisture Meter,
W72-13862 7B

KATZ, E. L.
Relative Resistance of Twenty Human Enteric Viruses to Free Chlorine in Potomac Water,
W72-13616 5F

KAUFMAN, A. J.
Cellulolytic Activity in Municipal Solid Waste Composting,
W72-13686 5B

KAWAKAMI, M.
Microcracking Effect on Flexural Strength of Concrete After Repeated Loading,
W72-13744 8F

KAY, J. N.
Analysis of Uncertainty in Settlement Prediction,
W72-13745 8D

KEDEM, O.
Transport Processes in Hyperfiltration Membranes I,
W72-14083 3A

Water Transport in Hyperfiltration Membranes,
W72-14072 3A

KEINATH, T. M.
Removal of Impurities from Trickling Filter Effluents by Coagulation,
W72-13826 5D

KELLER, R. A.
Studies of Moisture Status and Storage Conditions of Spring-Lifted, Mud-Packed Douglas-Fir Seedlings,
W72-14100 2I

KELLEY, P. L.
Tunable Infrared Laser Spectroscopy of Atmospheric Water Vapor,
W72-13732 2B

KEMP, A. L. W.
Electrodialysis: A Method for Extracting Available Nutrients in Great Lakes Sediments,
W72-13658 5C

KENDALL, H. A.
Design and Operation of Jet-Bit Programs for Maximum Hydraulic Horsepower, Impact Force or Jet Velocity,
W72-13626 8C

KENNEDY, V. S.
Effects of Temperature on the Respiratory Metabolism of Three Chesapeake Bay Bivalves,
W72-13997 5C

KEYES, C. JR
Disposal of Brine by Solar Evaporation,
W72-14077 2D

KHAN, R. A.
The Genesis of Selected Hydrochemical Facies in Baton Rouge, Louisiana, Ground Waters,
W72-14008 2F

KHARE, P. D.
A Note on the Response of the Rice Varieties to Varying Water Levels,
W72-14152 3F

KHOKHLOV, G. P.
Physics of Freshwater Ice (Fizika presnovodnogo l'da),
W72-14037 2C

KHUDYK, Y. H.
Erosion Control Practices in Primary Cultivation of Soil on Slopes of the Carpathians, (In Russian),
W72-14170 4D

KIAUTA, B.
Additions to the List of Odonata of the Dutch Wadden Islands, with an Account of Water Quality Data of Larval Habitats, and a Review of the Dragonfly Fauna of the Dutch and German Northsea Islands,
W72-14162 2I

KIMURA, Y.
Studies on the Behaviours and Distribution of Radioactive Substances in Coastal and Estuarine Waters,
W72-13976 5B

KING, D. A.
The Recreational Value of a Small Reservoir in an Arid Environment,
W72-13994 6D

KING, G. R.
Why Rock-Bit Bearings Fail,
W72-13632 8G

KING, K. P.
Contamination of Lettuce Irrigated with Sewage Effluent,
W72-14104 5B

KINLEN, P. J.
Wax-Bound Lead Dioxide Potentiometric Electrode and Applications to Chelometric Titration,
W72-13676 5A

KLAUSING, R. L.
Ground-Water Resources of McLean County, West-Central North Dakota,
W72-13716 7C

KLEVENO, CONRAD
Hypothesis for Dissolved Oxygen Depletion in the Central Basin Hypolimnion of Lake Erie,
W72-13659 5C

KLYM, T. W.
A Study of Anchorages for Transmission Tower Foundations,
W72-13750 8C

KNETSCH, J. L.
Recreation Benefit Estimation and Forecasting: Implications of the Identification Problem,
W72-13934 6A

KOCH, C. J.
Measurements of Very Low Oxygen Tensions in Unstirred Liquids,
W72-13785 5A

KOEPF, E. H.
Oil Skimming Apparatus,
W72-13894 5G

KOGA, T.
Studies on the Behaviours and Distribution of Radioactive Substances in Coastal and Estuarine Waters,
W72-13976 5B

KONEFES, J. L.
Growth of the Fathead Minnow (Pimephales Promelas) in Tertiary Treatment Ponds,
W72-13868 5C

KOSOGOROVA, T. A.
Effect of Pumping Freshwaters Into Oil Strata of the Perm Prikamje on the Distribution of Microflora, (In Russian),
W72-14135 5C

KOSTOVETSKII, Y. I.
Hygienic Standardization of Phenol in Water Bodies (In Russian),
W72-14157 5F

KOTHANDARAMAN, V.
A Probabilistic Analysis of Dissolved Oxygen-Biochemical Oxygen Demand Relationship in Streams,
W72-13688 5B

KOVDA, V. A.
Origin of Saline Soils and Their Regime, Volume 2,
W72-14041 3C

KOYANAGI, T.
On The Physico-Chemical Behavior of Radioactive Cerium in Sea Water,
W72-13970 5B

KREMEN, S. S.
Reverse Osmosis Membrane Module (Spiral-Wound Concept),
W72-14069 3A

Reverse Osmosis Membrane Module (Spiral Wound Concept),
W72-14087 3A

KRIPANARAYANAN, K. M.
Short-Time Deflections of Beams Under Single and Repeated Load Cycles,
W72-13749 8F

KRIZEK, R. J.
Analysis of Uncertainty in Settlement Prediction,
W72-13745 8D

KRONFELD, JOEL
U234/U238 Disequilibrium in Groundwaters of Central Texas,
W72-13971 5B

KRUUV, J.
Measurements of Very Low Oxygen Tensions in Unstirred Liquids,
W72-13785 5A

KUFRIN, R. J.
Method for Preventing Water Loss from Reservoirs and Channels,
W72-13889 4A

KULIK, V. YA.
Use of Capillary Columns to Study Infiltration of Water Into Frozen Soil (Skhema kapillyarnykh kolonn dlya vpityvaniya vody v merzlyy grunt),
W72-14031 2G

KUNZ, G.
Ion Exchange Apparatus for Treating Liquids,
W72-13885 3A

KUSHWAHA, P. S.
Effect of Irrigating Wheat Crop at Different Stages,
W72-14151 3F

LAFLEUR, P. D.
Method for Determination of Mercury in Biological Materials by Neutron Activation Analysis,
W72-13788 5A

LAGARRIGUE, J. G.
Littoral Oniscoids from the Thau Basin (Mediterranean Littoral Pond): Faunistic and Ecological Study (In French),
W72-14166 2H

LAL, R.
Infiltration and Structural Changes as Influenced by Initial Moisture Content,
W72-14196 2G

LAMONT, P. E.
Exploratory Study of Brine Disposal Using Fluid-Bed Evaporation,
W72-14063 5E

LANGFORD, J. C.
Transport and Depletion of Radionuclides in the Columbia River,
W72-13975 5B

LANKARD, D. R.
Factors Affecting the Flexural Strength of Steel Fibrous Concrete,
W72-13754 8F

LARSON, T. L.
Reverse Osmosis Membrane Module (Spiral Wound Concept),
W72-14087 3A

LAST, P. J.
Effects of Cultural Practices and Fertilizers on Sugar Beet Quality,
W72-14139 5C

LAUGHRAN, H. S.
The Law and the Corporate Polluter: Flexibility and Adaption in the Developing Law of the Environment,
W72-13938 5G

LAZDAUSKAITE, Z. P.
Spread of the Orange Lily in the River Valleys of Lithuania,
W72-14168 2I

LEE, G. FRED
PCBs in Fish from the Milwaukee Region,
W72-13652 5C

LEE, TERRENCE R.
Symposium: Public Involvement in the Water Management Problems in the Great Lakes,
W72-13665 5C

LEGROS, P. G.
A Study of the Disposal of the Effluent from a Large Desalination Plant,
W72-14086 5B

LEIJNSE, D.
Permeability Distribution in a Holocene Distributary Channel-Fill Near Leerdam (The Netherlands),
W72-13730 2J

LELENTAL, M.
Determination of Submicrogram Amounts of Boron Using the B-10 (n, alpha) Li-7 Reaction,
W72-13784 5A

LESPINAT, P. A.
Water Profile Fluctuations Recorded Beneath Some Forage Plants During the Dry Season Using the Neutron Method, (In French),
W72-14138 7B

LESSING, P.
Geological Considerations of Sanitary Landfill Site Evaluations,
W72-13719 5B

LEUNG, P. S.
A Neutron Scattering Study of the Kinetics of Diffusion and the Relation to the Structures of Ionic Solutions,
W72-14067 1B

LEVESQUE, LUCIEN
The Ichthyofauna and Flora of Lake St. Louis on the St. Lawrence River Near Montreal, Quebec: General Features and Recent Changes,
W72-13647 5C

LEWIS, J. D.
A Modified Plastic Bag Combustion Technique for the Radioassay of C-14 and H-3 in Biological Tissues,
W72-13670 5A

LICHTE, F. E.
Emission Spectrometric Determination of Trace Amounts of Mercury,
W72-13790 5A

LICK, W.
Effect of Eddy Diffusivity on Wind-Driven Currents in a Two-layer Stratified Lake,
W72-14010 2H

LILLARD, J. H.
Evaluation of a Deterministic Model for Predicting Water Yields from Small Agricultural Watersheds in Virginia,
W72-13824 2A

LIN, CHANG-KWEI
Availability of Phosphorus for Cladophora Growth in Lake Michigan,
W72-13644 5C

LINDGREN, S.
Development of Lactic Acid Bacteria During Early Stages of Fermentation in Fish Silage,
W72-13683 5A

LINEBACK, J. A.
Geologic Cross Sections Derived from Seismic Profiles and Sediment Cores from Southern Lake Michigan,
W72-13844 2J

LINGERTAT, H.
Anomalous Water,
W72-13842 1B

LIPOVSKAYA, V. I.
Snowfall and Snow Transport During Snowstorms Over the USSR,
W72-13852 2C

LIPOVSKY, V. P.
Mortality of Pacific Oysters (Crassotrea GI-Gas): The Influence of Temperature and Enriched Seawater on Oyster Survival,
W72-13875 5C

LIU, A. P.
Strontium-90 and Cesium-137 in Canned Seafood, Taiwan, Republic of China, 1970-1971,
W72-13990 5A

LIU, O. C.
Relative Resistance of Twenty Human Enteric Viruses to Free Chlorine in Potomac Water,
W72-13616 5F

LIVINGSTON, R. K.
Selected Streamflow Characteristics as Related to Channel Geometry of Perennial Streams in Colorado,
W72-13736 2E

LOBMEYER, D. H.
Ground Water in Kearny County, Southwestern Kansas,
W72-13715 7C

LOGVINOVICH, G. V.
Hydrodynamics of Free-Boundary Flows,
W72-14040 8B

LOHNERT, E. P.
Contribution to the Geochemistry of Groundwater in Northern Germany,
W72-13725 2K

LOMNITZER, R.
Synchronization of Cell Division in Escherichia Coli by Elevated Temperatures: A Reinterpretation,
W72-13666 5C

LONG, E. B.
A Quantitative Comparison of Pigment Extraction by Membrane and Glass-Fiber Filters,
W72-13673 5A

LONGLEY, A. J.
Pressure-Differential Sticking of Drill Pipe and How it Can be Avoided or Relieved,
W72-13630 8C

LONSANE, B. K.
Growth of Endomycopsis Lipolytica on Hydrocarbons,
W72-13817 5A

LOSSIN, R. D.
Cellulolytic Activity in Municipal Solid Waste Composting,
W72-13686 5B

LOVEJOY, E. M. P.
Nonantecedent Development of Truckee River Canyon, Northern Carson Range, Nevada and California,
W72-14015 2J

LOWE, E.
Reverse Osmosis System,
W72-13879 3A

LUMMUS, J. L.
Chemical Removal of Drilled Solids,
W72-13624 8G

A New Look at Lost Circulation,
W72-13623 8G

Squeeze Slurries for Lost Circulation Control,
W72-13622 8G

Use of Chemicals to Maintain Clear Water for Drilling,
W72-13628 8C

MACIEJOWSKA-POKACKA, Z.
Reaction of Soil Fungi and Other Microorganisms to Various Levels of Nitrogen Fertilization and Irrigation of Cocksfoot (Dactylis Glomerata L.). (In Polish),
W72-14158 5C

MAGNIANT, D.
The Soils of the Wooded District of the Southeastern Morne Department: Soil Formation and General Data on Water Management,
W72-13918 2G

MAGNIER, Y.
The Hydrological Conditions of Ambaro Bay (Northwestern Madagascar): Contribution to the Study of a Tropical Eutrophic Bay, (In French),
W72-14182 5C

MAINE, C. A.
Report for the 12 Month Period July 1, 1970-June 30, 1971,
W72-14051 5A

MAKI, T. E.
Effects of Land Use on Municipal Watersheds,
W72-13759 4C

MALYSHEV, I. S.
Water Erosion of Soils on the Right Bank of the Selenga River, (In Russian),
W72-14175 2J

MANDAL, S. C.
Investigations on Rainy Season Potato in the Plateau Region of Chotanagpur,
W72-14091 3F

MANDELLI, E. F.
A Study of the Disposal of the Effluent from a Large Desalination Plant,
W72-14086 5B

MANDLOI, K. K.
Effect of Irrigating Wheat Crop at Different Stages,
W72-14151 3F

MANGANELLI, R. M.
Radiation Treatment of Materials,
W72-13883 5D

MANN, A. H.
Biodegradation of Synthetic Detergents Evaluation by Community Trials: 1. Linear Alkylbenzene Sulfonates,
W72-13703 5D

MAREK, M.
Preliminary Observations of Superintensive Fish Culture in the Beith-Shean Valley in 1969-1970,
W72-14111 8I

MARINO, M. A.
Nonsteady Flow in a Recharge Well-Unconfined Aquifer System,
W72-13828 2F

MARK, W. R.
Lodgepole Pine-Dwarf Mistletoe Xylem Water Potentials,
W72-14119 2I

MARTFELD, D. E.
California High Water, 1969-1970,
W72-14013 2E

MARTH, E. H.
Loss of Viability by Staphylococcus Aureus in Acidified Media. I., Inactivation by Several Acids, Mixtures of Acids, and Salts of Acids,
W72-13777 5C

MASE, J. R.
Nutrient Studies in Texas Impoundments,
W72-13692 5C

MASON, HENRY L.
Freezing Process Studies,
W72-14070 3A

MATHEWS, T. D.
The Geochemistry of Radiocarbon in the Gulf of Mexico,
W72-13981 5B

MATSUMURA, F.
DDT: Inhibition of Sodium Chloride Tolerance by the Blue-Green Alga Anacystis Nidulans,
W72-13809 5C

MC COY, C. W.
A Device for Measuring and Recording the Amount and Duration of Free Water on Vegetation in the Field,
W72-14094 3F

MCADOO, G. D.
Records of Wells in Harris County, Texas, 1892-1972,
W72-14027 4B

MCCABE, PATRICIA A.
Effect of Mineral Particulates on Microbial Degradation of Solid Organic Materials,
W72-13645 5C

MCCARREN, E. F.
Water Quality of Streams in the Neshaminy Creek Basin, Pennsylvania,
W72-13737 2K

MCCONNELL, G. E.
Let Your Irrigation System Do All the Work,
W72-13911 3F

MCDONNELL, ARCHIE J.
Variations in Oxygen Consumption by Aquatic Macrophytes in a Changing Environment,
W72-13646 5C

MCELROY, KENNETH E., JR
Symposium: Public Involvement in the Water Management Problems in the Great Lakes,
W72-13665 5C

MCFETERS, G. A.
Effect of Temperature on the Respiration and Cytochromes of an Extreme Thermophile,
W72-13765 5C

MCGOVERN, H. E.
Ground Water in Kearny County, Southwestern Kansas,
W72-13715 7C

MCILHENNY, W. F.
A Study of the Disposal of the Effluent from a Large Desalination Plant,
W72-14086 5B

MCILROY, I. C.
An Instrument for Continuous Recording of Natural Evaporation,
W72-14136 7B

MCKAY, G. A.
Mechanical Balance: Electrical Readout Weighing Lysimeter,
W72-14185 7B

MCLELLON, W. M.
Basic Principles of Advanced Waste Treatment,
W72-13705 5D

The Removal of Radionuclides From Water by Hydrous Ferric Oxide,
W72-13699 5D

MCNAUGHT, D. C.
Influences of Thermal Effluents Upon Aquatic Production in Lake Ontario,
W72-13642 5C

MCNAUGHTON, K. G.
Psychrometric Apparatus for Bowen-Ratio Determination Over Forests,
W72-14184 7B

MECHALAS, B. J.
Biological Degradation of Cellulose Acetate Reverse Osmosis Membranes,
W72-14079 3A

MELINTE, C.
The Effect of Certain Chlorinated Organic Pesticides on Hygienic Indicators of Water,
W72-14164 5C

MELLOR, G. E.
Studies of Moisture Status and Storage Conditions of Spring-Lifted, Mud-Packed Douglas-Fir Seedlings,
W72-14100 2I

MENEGHINI, D.
On Some Modifications in the Venetian Climate During the Last Thirty Years: Repercussions of the Phenomenon of Flood Waters,
W72-13757 2B

MENSHUTKIN, V. V.
Functional Model of the Lake Ecological System (In Russian),
W72-14167 5C

MERCADO, A.
An Integration of the Agricultural Demand Function for Water and the Hydrologic Model of the Pecos Basin,
W72-13993 6D

MERDINGER, E.
Effect of Cyclamates on the Growth of Pullularia Pullulans,
W72-13814 5C

MEUZELAAR, H. L. C.
A Technique for Curie Point Pyrolysis Gas Chromatography of Complex Biological Samples,
W72-13761 5A

MEYER, R. P.
Geologic Cross Sections Derived from Seismic Profiles and Sediment Cores from Southern Lake Michigan,
W72-13844 2J

MEYER, W. R.
Development of Ground Water in the El Paso District, Texas, 1963-70,
W72-14029 2F

MICHALSKI, M. F. P.
A Case of Nutrient Enrichment in an Inshore Area of Georgian Bay,
W72-13662 5C

MICKELSON, D. M.
Chronology of a Kettle-Hole Peat Bog, Cherryfield, Maine,
W72-14019 2J

MIHURSKY, J. A.
Effects of Temperature on the Respiratory Metabolism of Three Chesapeake Bay Bivalves,
W72-13997 5C

MIKHEL, V. M.
Snowfall and Snow Transport During Snowstorms Over the USSR,
W72-13852 2C

MILLAR, B. D.
Improved Thermocouple Psychrometer for the Measurement of Plant and Soil Water Potential: II. Operation and Calibration,
W72-14120 7B

MILLER, J. C.
Geology and Ground Water, University of Delaware, Newark, Delaware,
W72-13833 4B

Ground-Water Geology of the Delaware Atlantic Seashore,
W72-13835 2F

Groundwater Resources of Saline County, Missouri,
W72-14011 2F

Nitrate Contamination of the Water-Table Aquifer in Delaware,
W72-13834 5B

MILLET, R.
The Main Physico-Chemical Characteristics of Soils of the Vertisal and Sodium-Containing Type in the Rochefort Marsh at St-Laurent-De-La-Pree (Maritime Charente, France),
W72-14190 2G

MILLIMAN, J. D.
Atlantic Continental Shelf and Slope of the United States-Petrology of the Sand Fraction of Sediments, Northern New Jersey to Southern Florida,
W72-13830 2J

MILLS, EDWARD L.
Five Trace Elements and Vitamin B-12 in Cayuga Lake,
W72-13660 5C

MILNE, T. A.
An Experimental Study of the Structure, Thermodynamics and Kinetic Behavior of Water,
W72-14060 1B

MILOSHEVICH, V. A.
Calculation of Rate of Extension of Ice Cover in Afterbays of Reservoirs (Raschet nastupleniya kromki ledyanogo pokrova v nizhikh b'yefakh vodokhranilishch),
W72-14033 2C

MINKOV, B. YA.,
A Radiation Mole Flow-Moisture Meter,
W72-13862 7B

MINOR, T. E.
Loss of Viability by Staphylococcus Aureus in Acidified Media. I., Inactivation by Several Acids, Mixtures of Acids, and Salts of Acids,
W72-13777 5C

MIRCHANDANI, K.
Effect of Saline Waters on the Germination of Watermelon (Citrullus Vulgaris Schrad. ex Eckl. et Zeyh.),
W72-14126 3C

MISSIRLIS, JOHN
Freezing Process Studies,
W72-14070 3A

MITCHELL, N. T.
The Evaluation of Public Radiation Exposure from the Controlled Marine Disposal of Radioactive Waste (With Special Reference to the United Kingdom),
W72-13977 5B

MOENS, C.
Permeability Distribution in a Holocene Distributary Channel-Fill Near Leerdam (The Netherlands),
W72-13730 2J

MOFFA, PETER E.
Comprehensive Abatement Program for an Eutrophic Lake,
W72-13663 5C

MOISAN, G.
The Spartina Tidal Marshes of the St. Lawrence Estuary and Their Importance to Aquatic Birds,
W72-14128 2L

MOLLS, F. B.
Effect of Eddy Diffusivity on Wind-Driven Currents in a Two-layer Stratified Lake,
W72-14010 2H

MONADJEMI, P.
Oxygen Uptake and Mechanism of Substrate Purification in a Model Trickling Filter,
W72-13697 5D

MONKMEYER, P. L.
Delayed Yield and Unsaturated Flow Above a Falling Water Table,
W72-14052 2G

Unsteady Flow of Ground Water,
W72-14053 2F

MONTGOMERIE, J. Z.
Osmotic Stability and Sodium and Potassium Content of L-Forms of Streptococcus Faecalis,
W72-13764 5C

MOOK, W. G.
Application of Natural Isotopes in Ground Water Hydrology,
W72-13728 2F

MOORE, D. O.
Selected Streamflow Characteristics as Related to Channel Geometry of Perennial Streams in Colorado,
W72-13736 2E

MOREL-SEYTOUX, H. J.
Perturbation Analysis of Two-Phase Infiltration,
W72-14006 2G

Techniques of Statistical Evaluation of Runoff Results of Precipitation Modification,
W72-13841 2A

Test of Runoff Increase Due To Precipitation Management for the Colorado River Basin Pilot Project,
W72-13912 3B

MORIN, O. J.
V.T.E. Desalting Plant, St. Croix, U.S. Virgin Islands Analysis of Operational Data,
W72-14058 3A

MORISHIMA, H.
Studies on the Behaviours and Distribution of Radioactive Substances in Coastal and Estuarine Waters,
W72-13976 5B

MORIZET, J.
The Main Physico-Chemical Characteristics of Soils of the Vertisal and Sodium-Containing Type in the Rochefort Marsh at St-Laurent-De-La-Pree (Maritime Charente, France),
W72-14190 2G

MORRIS, H. M.
Roughness Elements as Energy Dissipators of Free-Surface Flow in Circular Pipes,
W72-13747 8B

MORRIS, R. L.
Pesticide and Mercury Levels in Migrating Duck Populations,
W72-13865 5C

MORRISON, G. H.
On-Line Computer-Controlled Electrical Detection in Spark Source Mass Spectrometry,
W72-13770 7B

Precision of Electrical Detection Measurements of Powdered Samples in Spark Source Mass Spectrometry,
W72-13787 5A

MORROW, C. H.
Suspended Sediment Data Summary March 1966-May 1967, Upper Chesapeake Bay (Tolchester to Havre De Grace),
W72-13849 2L

MOURA FE, J. A.
Evaluation of Methods for Detection of Coliform Bacteria in Raw Milk,
W72-13671 5A

MUELLER, J. A.
Biological Denitrification Using Fluidized Granular Beds,
W72-14047 5D

MUENCH, N. L.
Analytical Determination of Optimum Bit Weight and Rotary Speed Combinations,
W72-13619 8C

MUKAMMAL, E. I.
Mechanical Balance: Electrical Readout Weighing Lysimeter,
W72-14185 7B

MUKHERJEE, K. D.
New Methods for Detection and Quantification in Thin-Layer Chromatography: A Study of Pyrolysis and Combustion Systems,
W72-13768 5A

MULQUEEN, J.
An Analysis of the Rainfall Variations in County Leitrim and Their Influence on Agricultural Production,
W72-13713 3F

MUMANENKO, A. F.
Use of Zaytsev Method for Determining the Water Content of Fogs in Chambers,
W72-13863 7B

MUNDORFF, M. J.
Electric Analog Studies of Flow to Wells in the Punjab Aquifer of West Pakistan,
W72-13735 2F

MURDROCHOVA, ALENA
Electrodialysis: A Method for Extracting Available Nutrients in Great Lakes Sediments,
W72-13658 5C

MURPHY, R. S.
The Biodegradation of Organic Substrates Under Arctic and Subarctic Conditions,
W72-13822 5C

MURRAY, A. P.
The Biodegradation of Organic Substrates Under Arctic and Subarctic Conditions,
W72-13822 5C

MURRAY, C. N.
Adsorption-Desorption Equilibria of Some Radionuclides in Sediment-Freshwater and Sediment-Seawater Systems,
W72-13974 5B

MURRAY, C. R.
Estimated Use of Water in the United States in 1970,
W72-13829 6D

MURRAY, L.
Adsorption-Desorption Equilibria of Some Radionuclides in Sediment-Freshwater and Sediment-Seawater Systems,
W72-13974 5B

MURRAY, W. A.
Delayed Yield and Unsaturated Flow Above a Falling Water Table,
W72-14052 2G

Unsteady Flow of Ground Water,
W72-14053 2F

MUSKAT, J.
Method and Apparatus for Treating Water,
W72-13902 5D

MYERS, D. A.
Test-Observation Well Near Davenport, Washington: Description and Preliminary Results,
W72-13733 4B

MYERS, G. JR
Microdetermination of Carbon, Hydrogen, Nitrogen and Oxygen in Petroleum Compounds with an Automatic Elemental Analyzer,
W72-13805 5A

MYTELKA, A. I.
Radiation Treatment of Materials,
W72-13883 5D

NAFTEL, W. L.
Records of Wells in Harris County, Texas, 1892-1972,
W72-14027 4B

NAGA, M.
Effect of Land use Period on Soil Properties,
W72-13922 2G

NAGAI, KYOZO
On Nitrogen Forms in Dew or Frost Water: II. On the Changes of Nitrogen Dioxide in the Air, (In Japanese),
W72-14186 5B

NAGPAL, M. L.
Effect of Soil-Moisture Stress on the Lipid Quality of Matured Wheat Grains,
W72-14155 3F

NAGY, Z. I.
Aspects of the Nutritive Dynamics and Trophic Relationships of the Burbot (Lota Lota Lota L.) in the Upper Mures River, (In Rumanian),
W72-14127 2H

NAIMPALLY, ASHOK
Freezing Process Studies,
W72-14070 3A

NEELY, J. M.
Natural Population Dynamics of Phlebotomine Sandflies in Panama,
W72-14147 2I

NELSON, DONALD M.
Radionuclide Concentrations Near the Big Rock Point Nuclear Power Station,
W72-13661 5C

NELSON, F. E.
Evaluation of Methods for Detection of Coliform Bacteria in Raw Milk,
W72-13671 5A

NESTOR, I.
The Removal of Coxsackie Virus from Water by Sand Obtained from the Rapid Sand Filters of Water-Plants,
W72-14156 5F

NEWBERNE, P. M.
Chronic Exposure of Rats to Methyl Mercury in Fish Protein,
W72-13780 5C

NEWTON, A. J.
Seasonal Variation of the Suspended Solid Matter, Off the Coast of North Yorkshire,
W72-13682 5B

NEZHIKHOVSKIY, R. A.
Channel Network of a Basin and Formation of Runoff (Ruslovaya set' basseyna i protsess formirovaniya stoka vody),
W72-13853 2E

NICHOLS, A. A.
Contamination of Lettuce Irrigated with Sewage Effluent,
W72-14104 5B

NIEMI, A.
Dynamics of Phytoplankton Primary Production and Biomass in Loviisa Archipelago (Gulf of Finland),
W72-13871 5C

NIGAM, J. N.
Growth of Endomycopsis Lipolytica on Hydrocarbons,
W72-13817 5A

NILL, K. W.
Tunable Infrared Laser Spectroscopy of Atmospheric Water Vapor,
W72-13732 2B

NILSSON, C. A.
An Artifact in the Gas Chromatographic Determination of Impurities in Pentachlorophenol,
W72-13774 5A

NILSSON, R.
Development of Lactic Acid Bacteria During Early Stages of Fermentation in Fish Silage,
W72-13683 5A

NISHIWAKI, Y.
Studies on the Behaviours and Distribution of Radioactive Substances in Coastal and Estuarine Waters,
W72-13976 5B

NOBLANC, A.
Perturbation Analysis of Two-Phase Infiltration,
W72-14006 2G

NOSHKIN, V. E.
Concentrations and Distributions of Long-Lived Fallout Radionuclides in Open Ocean Sediments,
W72-13980 5B

NOWAK, FELIKS
Tentative Evaluation of Industrial Damage in Stands of the Golonog Forest District,
W72-14095 5C

NUSBAUM, L.
Reverse Osmosis Membrane Module (Spiral Wound Concept),
W72-14087 3A

NUSS, F.
Ability of Drilling Mud to Lift Bit Cuttings,
W72-13629 8B

NUTTER, L. J.
Ground-Water Occurrence in the Maryland Piedmont,
W72-13848 2F

O'BRIEN, W. J.
Changes in Plankton Species Composition and Diversity in a Controlled Nutrient Enrichment Study,
W72-13816 5C

OGINO, S.
Microcracking Effect on Flexural Strength of Concrete After Repeated Loading,
W72-13744 8F

OGLESBY, RAY T.
Five Trace Elements and Vitamin B-12 in Cayuga Lake,
W72-13660 5C

O'HARA, J.
A Continuously Monitored Respiration Chamber for Fish,
W72-13872 5A

OLAH, JANOS
Glass Effect and the Microbial Plankton-Seston Relation in the Water of Lakes Balaton and Belso,
W72-14161 5C

The Influence of Zala River on the Bacteriological Condition in Keszthely-Bay (Lake Balaton),
W72-14154 5C

OLDHAM, K. B.
Semiintegral Electroanalysis: Theory and Verification,
W72-13791 2K

OLGA, S.
Cladocera Studies on Lake Balaton: IV. Subfossil Remains in the Sediments of Lake Balaton II,
W72-14160 2H

OLGARD, G.
Flow Stabilizing Through Laminar Separation Apparatus,
W72-13877 5D

O'NEILL, T. B.
The Biodegradation of Oil in Seawater for Naval Pollution Control,
W72-14012 5B

OSTROMECKI, J.
Participation of Moisture Rising from Ground Water in Covering Water Deficiencies Between Evapotranspiration and Precipitations, (In Polish),
W72-14177 2G

OTTON, E. G.
Ground-Water Occurrence in the Maryland Piedmont,
W72-13848 2F

OVERMAN, A. R.
Wastewater Renovation at Tallahassee - Experimental Studies,
W72-13711 5D

PAGEAU, GERARD
The Ichthyofauna and Flora of Lake St. Louis on the St. Lawrence River Near Montreal, Quebec: General Features and Recent Changes,
W72-13647 5C

PALLAS, J. E. JR
Transpiration of Antirrhinum Majus L. 'Panama' as Influenced by Soil Temperature,
W72-14102 2D

PANOV, G. M.
Present State of Castor Fiber L. Population in the Upper and Middle Flow of the Ubort River and Prospects of Its Economic Use (In Russian),
W72-14159 2I

PASK, W. M.
Efficiency of Sucrose Flotation in Recovering Insect Larvae From Benthic Stream Samples,
W72-14116 2I

PATRICK, G. W.
California High Water, 1969-1970,
W72-14013 2E

PATTON, R. A.
Recreation Benefit Estimation and Forecasting: Implications of the Identification Problem,
W72-13934 6A

PEARSON, E. G.
Limnological Studies of Big Bear Lake, California,
W72-13739 5C

PECK, A. J.
Redistribution of Soil Water After Infiltration,
W72-14197 2G

PEIRCE, L. B.
Water for Alabama, The Alabama Water-Resources Spectrum--Second Progress Report,
W72-14024 5G

PERKINS, R. W.
Transport and Depletion of Radionuclides in the Columbia River,
W72-13975 5B

PETERSEN, M. R.
Transport and Depletion of Radionuclides in the Columbia River,
W72-13975 5B

PETERSON, H. P.
Spectrophotometric Method for Determining Low Levels of Water-Soluble Boron in Fertilizers,
W72-13782 5A

PFISTER, R. M.
Chlorinated Hydrocarbon, Microparticulate Effects on Microorganisms Isolated from Lake Erie,
W72-13999 5C

PFLIEGER, W. L.
A Distributional Study of Missouri Fishes,
W72-13910 2I

PICKETT, T. E.
Geology and Ground Water, University of Delaware, Newark, Delaware,
W72-13833 4B

PITON, B.
The Hydrological Conditions of Ambaro Bay (Northwestern Madagascar): Contribution to the Study of a Tropical Eutrophic Bay, (In French),
W72-14182 5C

PLACE, J.
Process for Treating Water with a Polyhalide Resin Using a Semipermeable Membrane Barrier,
W72-13887 5F

PODALL, H. E.
Transport Property Requirements of Membranes for Use in Pressure Dialysis Desalination,
W72-14088 3A

POKHARNA, U. S.
Effect of Saline Waters on the Germination of Watermelon (Citrullus Vulgaris Schrad. ex Eckl. et Zeyh.),
W72-14126 3C

POLTORAK, TADEUSZ
The Plankton of Lake Gardno Near the Baltic Sea During the Summer Season,
W72-13637 5C

PONYI, JENO E.
The Horizontal Distribution of Rotifera Plankton in Lake Balaton,
W72-14163 5C

POUVREAU, M.
The Main Physico-Chemical Characteristics of Soils of the Vertisal and Sodium-Containing Type in the Rochefort Marsh at St-Laurent-De-La-Pree (Maritime Charente, France),
W72-14190 2G

POWELL, E. O.
Hypertrophic Growth,
W72-13668 5C

POWERS, CHARLES F.
Distribution of Chlorophyll and Its Relation to Particulate Organic Matter in the Offshore Waters of Lake Michigan,
W72-13648 5C

POWERS, W. R. III
Water-Quality Reconnaisance of the Lower Santa Ana River Canyon, Southern California,
W72-13720 2K

POZIOMEK, E. J.
Analytical Uses of Charge-Transfer Complexation: Spectrophotometric Method for Iodide in Water,
W72-13792 5A

PRASAD, T.
Theory of Stochastic Modeling of Watershed Systems,
W72-14007 2A

PREPEJCHAL, WILLIAM
Radionuclide Concentrations Near the Big Rock Point Nuclear Power Station,
W72-13661 5C

PRESTON, A.
The Evaluation of Public Radiation Exposure from the Controlled Marine Disposal of Radioactive Waste (With Special Reference to the United Kingdom),
W72-13977 5B

PRIEGEL, G. R.
Evaluation of Intensive Freshwater Drum (Aplodinotus Grunniens) Removal in Lake Winnebago, Wisconsin, 1955-1966,
W72-14109 2H

PRITCHARD, D. W.
Design and Siting Criteria for Once-Through Cooling Systems Based on a First-Order Thermal Plume Model,
W72-14030 5C

PROBSTEIN, R. F.
A Turbulent Flow Theory of Electrodialysis,
W72-14061 3A

PYE, D. G.
Desalination Apparatus and Process of Manufacture Using Improved, Acid Grafted Nitrogenous Membranes,
W72-13886 3A

PYSHKIN, O. B.
An Experimental Rock-Sand Dam,
W72-13752 8D

RAGSDALE, B. J.
Declaring War....On Mesquite,
W72-13925 3B

RAJALA, O.
Development of Lactic Acid Bacteria During Early Stages of Fermentation in Fish Silage,
W72-13683 5A

RAJAN, K. S.
Application of Inorganic Ion Exchange MEMBRANES TO Electrodialysis,
W72-14081 3A

RANDLES, C.I.
Chlorinated Hydrocarbon, Microparticulate Effects on Microorganisms Isolated from Lake Erie,
W72-13999 5C

RAO, M. S. S.
Investigations on Rainy Season Potato in the Plateau Region of Chotanagpur,
W72-14091 3F

RAPPE, C.
An Artifact in the Gas Chromatographic Determination of Impurities in Pentachlorophenol,
W72-13774 5A

RAWSTRON, R. R.
Harvest, Survival, and Cost of Two Domestic Strains of Tagged Rainbow Trout Stocked in Lake Berryessa, California,
W72-14181 2H

RAY, B.
Acceleration Units,
W72-13880 5D

REED, A.
The Spartina Tidal Marshes of the St. Lawrence Estuary and Their Importance to Aquatic Birds,
W72-14128 2L

REEVE, R. M.
Cell Size in Russet Burbank Potato Tubers With Various Levels of Nitrogen and Soil Moisture Tensions,
W72-14124 3F

REEVES, E. B.
Estimated Use of Water in the United States in 1970,
W72-13829 6D

REGE, M. S.
Observations on the Food and Feeding Behavior of the Common Bombay Catfish: Tachysurus Sona (HAM),
W72-14143 2I

REGER, D. W.
Analytical Uses of Charge-Transfer Complexation: Spectrophotometric Method for Iodide in Water,
W72-13792 5A

REID, C. P. P.
Lodgepole Pine-Dwarf Mistletoe Xylem Water Potentials,
W72-14119 2I

REID, V. W.
Biodegradation of Synthetic Detergents Evaluation by Community Trials: 1. Linear Alkylbenzene Sulfonates,
W72-13703 5D

REIDINGER, A. B.
Reverse Osmosis Membrane Module (Spiral-Wound Concept),
W72-14069 3A

REILLY, B. B.
Sewage Treating Apparatus and Method,
W72-13900 5D

REIMNITZ, E.
River Discharge into an Ice-Covered Ocean and Related Sediment Dispersal, Beaufort Sea, Coast of Alaska,
W72-14020 2J

RENFRO, J. L.
Osmotic Acclimation in the Red River Pupfish, Cyprinodon rubrofluviatilis,
W72-13680 2I

REPPERT, R. S.
Geological Considerations of Sanitary Landfill Site Evaluations,
W72-13719 5B

REYNOLDS, J. D.
A Guide to the External Sexing of Some West African Freshwater Fishes,
W72-14145 2I

REYNOLDSON, T. B.
Intraspecific Competition in Lake-Dwelling Triclads: A Laboratory Study,
W72-14132 2H

RHEFELDT, G. E.
Strobili Development in Western White Pine: Periodicity, Prediction, and Association with Weather,
W72-14121 2I

RICE, PHILIP A.
Freezing Process Studies,
W72-14070 3A

RIEDINGER, A. B.
Reverse Osmosis Membrane Module (Spiral Wound Concept),
W72-14087 3A

RILEY, J. P.
The Concentrations of Cadmium, Copper, Iron, Manganese, Molybdenum, Nickel, Vanadium and Zinc in Part of the Tropical Northeast Atlantic Ocean,
W72-13985 5A

RISEBROUGH, R. W.
Pollutant Concentrations in Abnormal Young Terns from Long Island Sound,
W72-14134 5C

ROBERTSON, ANDREW
Distribution of Chlorophyll and Its Relation to Particulate Organic Matter in the Offshore Waters of Lake Michigan,
W72-13648 5C

ROBERTSON, D. E.
Transport and Depletion of Radionuclides in the Columbia River,
W72-13975 5B

ROEBERT, A. J.
Fresh Water Winning and Salt Water Encroachment in the Amsterdam Dune Water Catchment Area,
W72-13724 4B

ROMBERG, GERALD P.
Radionuclide Concentrations Near the Big Rock Point Nuclear Power Station,
W72-13661 5C

ROMIJN, E.
Review of Geohydrological Activities in the Netherlands Since World War II, In Particular of the Government Institute for Water Supply,
W72-13721 2F

RON, E. Z.
Synchronization of Cell Division in Escherichia Coli by Elevated Temperatures: A Reinterpretation,
W72-13666 5C

ROOK, H. L.
Method for Determination of Mercury in Biological Materials by Neutron Activation Analysis,
W72-13788 5A

ROOS, L. J.
Private Remedies to Abate Water Pollution in Virginia and New Theories in Environmental Law,
W72-13937 5G

ROSE, JEANNE
Distribution of Chlorophyll and Its Relation to Particulate Organic Matter in the Offshore Waters of Lake Michigan,
W72-13648 5C

ROSE, T. A.
Control System for Waste Water Treatment Plants,
W72-13895 5D

ROSENBURG, N. J.
Simultaneous Determination of Short-Period Photosynthesis and Evapotranspiration,
W72-14009 3F

ROSHORE, E. C.
Investigation of Sinking Methods for Removal of Oil Pollution from Water Surfaces. Phase II. Methods of Test for Laboratory Evaluation of Oil Sinking Materials,
W72-13702 5G

ROTH, J. R.
On-Line Computer-Controlled Electrical Detection in Spark Source Mass Spectrometry,
W72-13770 7B

ROZANOVA, E. P.
Effect of Pumping Freshwaters Into Oil Strata of the Perm Prikamje on the Distribution of Microflora, (In Russian),
W72-14135 5C

RUDENKO, B.
On Calculation of the Areas of Off-Chart Chromatographic Peaks Using Data Obtained with the Aid of Integrators,
W72-13769 7B

RUDNEVA, A. V.
Snowfall and Snow Transport During Snowstorms Over the USSR,
W72-13852 2C

RUTLAND, R. B.
Transpiration of Antirrhinum Majus L. 'Panama' as Influenced by Soil Temperature,
W72-14102 2D

SACKETT, W. M.
The Geochemistry of Radiocarbon in the Gulf of Mexico,
W72-13981 5B

SAFFORD, G. J.
A Neutron Scattering Study of the Kinetics of Diffusion and the Relation to the Structures of Ionic Solutions,
W72-14067 1B

SAHAY, R. N.
Inorganic Phosphate Fractions in Calcareous Soils in Relation to Moisture and Incubation Period,
W72-14189 2G

SAHELI, F.
Test of Runoff Increase Due To Precipitation Management for the Colorado River Basin Pilot Project,
W72-13912 3B

SAHI, B. P.
Inorganic Phosphate Fractions in Calcareous Soils in Relation to Moisture and Incubation Period,
W72-14189 2G

SAIKI, M.
On The Physico-Chemical Behavior of Radioactive Cerium in Sea Water,
W72-13970 5B

SANGAL, S. P.
Complexation of Metal Ions with Natural Polyelectrolytes (Removal and Recovery of Metal Ions from Polluted Waters),
W72-13776 5A

SARIG, S.
Fisheries and Fish Culture in Israel in 1970,
W72-14113 8I

Preliminary Observations of Superintensive Fish Culture in the Beith-Shean Valley in 1969-1970,
W72-14111 8I

SASS, J.
Oil Pollution: Persistence and Degradation of Spilled Fuel Oil,
W72-13810 5B

SAVORY, J.
Studies on the Determination of Physiological Levels of Chromium in Serum by Gas Chromatography,
W72-13767 5A

SCHAEFFLER, O. S.
Biological Degradation of Cellulose Acetate Reverse Osmosis Membranes,
W72-14079 3A

SCHAFER, C. T.
Sampling and Spatial Distribution of Benthonic Foraminifera,
W72-13674 5A

SCHELSKE, C. L.
Phytoplankton Assemblage Differences at Inshore Versus Offshore Stations in Lake Michigan, and Their Effects on Nutrient Enrichment Experiments,
W72-13650 5C

SCHELSKE, CLAIRE L.
Nutrients, Phytoplankton Productivity and Species Composition as Influenced by Upwelling in Lake Michigan,
W72-13649 5C

SCHIEMER, E. W.
A Device for Collecting In-Situ Samples of Suspended Sediment for Microscopic Analysis,
W72-13693 5A

SCHIPPER, W.
Notes on the Avifauna of the Marshy Area of Pierrepont-Sissonne (Laonnois-Aisne) II,
W72-13678 5C

SCHOELLER, D. A.
Wax-Bound Lead Dioxide Potentiometric Electrode and Applications to Chelometric Titration,
W72-13676 5A

SCHRODER, G. D.
Influences of Thermal Effluents Upon Aquatic Production in Lake Ontario,
W72-13642 5C

SCHROEDTER, H.
Statistical Studies on the Relation Between Nitrification and Soil Temperature and Soil Moisture,
W72-14200 2G

SCHUBEL, J. R.
Suspended Sediment Data Summary March 1966-May 1967, Upper Chesapeake Bay (Tolchester to Havre De Grace),
W72-13849 2L

Tidal Variation of the Suspended Sediment Size Distribution at a Station in Upper Chesapeake Bay,
W72-13837 2L

SCHULTZ, D. P.
The Effect of Light and Humidity on Absorption and Degradation of Diphenamid in Tomatoes,
W72-14125 3F

SCHULZ, R. A.
Patterns of Lakeshore Usage Around Lake Bemidji,
W72-14131 5C

SCHUPHAN, I.
Metabolism of Polychlorinated Norbornenes by Clostridium butyricum,
W72-13779 5B

SCOTT, P. P. JR
An Analysis and the Control of Lost Circulation,
W72-13627 8B

SEEDBURGER, D. JAMES
Radioactivity in Lake Michigan Water and Biota Vicinity of Big Rock Point Nuclear Reactor, 1960-69,
W72-13656 5C

SEGAR, W. A.
Macroreticular Resins-A Solution To Aggressive Conditions,
W72-13690 5D

SERAICHEKAS, H. R.
Relative Resistance of Twenty Human Enteric Viruses to Free Chlorine in Potomac Water,
W72-13616 5F

SETH, S. P.
Effect of Saline Waters on the Germination of Watermelon (Citrullus Vulgaris Schrad. ex Eckl. et Zeyh.),
W72-14126 3C

SHAHEEN, A. H.
Reproduction of Tilapia Nilotica L.,
W72-14042 8I

Tilapia Fishery in Lake Maruit: Age and Growth of Tilapia Nilotica L. In The Lake,
W72-14000 2H

SHAMIR, U.
Engineering and Economic Evaluation of the Reliability of Water Supply,
W72-13936 6D

SHANE, R. M.
A Statistical Analysis of Base-Flow Flood Discharge Data,
W72-13700 2E

SHANER, W. C. JR
Microdetermination of Carbon, Hydrogen, Nitrogen and Oxygen in Petroleum Compounds with an Automatic Elemental Analyzer,
W72-13805 5A

SHANHOLTZ, V. O.
Evaluation of a Deterministic Model for Predicting Water Yields from Small Agricultural Watersheds in Virginia,
W72-13824 2A

SHARMA, K. K.
A Note on the Response of the Rice Varieties to Varying Water Levels,
W72-14152 3F

SHAW, S. B.
DDT Residues in Eight California Marine Fishes,
W72-13946 5B

SHEA, W. J.
Report for the 12 Month Period July 1, 1970-June 30, 1971,
W72-14051 5A

SHELTON, S. P.
Virus Rem Oval by Chemical Coagulation,
W72-13684 5D

SHMUELI, M.
The Effect of Distance from the Tricklers on Soil Salinity and Growth and Yield of Sweet Corn in an Arid Zone,
W72-14105 3F

Emergence, Early Growth, and Salinity of Five Vegetable Crops Germinated by Sprinkle and Trickle Irrigation in an Arid Zone,
W72-14106 3F

Sprinkle and Trickle Irrigation of Green Pepper in an Arid Zone,
W72-14089 3F

Sprinkle, Furrow and Trickle Irrigation of Muskmelon in an Arid Zone,
W72-14090 3F

SHPUNT, B. R.
Platinum Minerals in Quaternary Sediments Between the Anabar and Olenek Rivers (Platinovyye mineraly chetvertichnykh otlozheniy Anabaro-Olenekskogo mezhdurech'ya),
W72-14035 2J

SHRIVASTAVA, M. N.
A Note on the Response of the Rice Varieties to Varying Water Levels,
W72-14152 3F

SHUBEL, J. R.
A Device for Collecting In-Situ Samples of Suspended Sediment for Microscopic Analysis,
W72-13693 5A

SHVARTS, YA. M.
Electricity of Clouds,
W72-14039 2B

SHVER, TS. A.
Estimating the Wetting of Walls by Driving Rain (Ob otsenke uvlazheniya sten pri kosykh dozhydakh),
W72-13855 7B

SIDDOWAY, F. H.
Seedbed Preparation and Seeding Methods to Establish Grassed Waterways,
W72-13914 4A

SIKKA, H. L.
Effect of Soil Moisture on the Phase Characters of Hatchlings in the Desert Locust, Schistocerca Gregaria Forsk,
W72-14092 2I

SILKER, W. B.
Transport and Depletion of Radionuclides in the Columbia River,
W72-13975 5B

SIMON, J. M.
Voltammetry in Methanol, Ethanol, and Sulfolane as Solvents,
W72-13794 5A

SIMONA, A.
The Effect of Certain Chlorinated Organic Pesticides on Hygienic Indicators of Water,
W72-14164 5C

SIMONS, D. B.
Riprapped Basins for Culvert Outfalls,
W72-13751 8A

SINCLAIR, MARGARET
A Survey of Housewives' Attitudes,
W72-13664 5C

SINGH, D. K.
Cropping Pattern in Relation to Well Irrigation,
W72-14150 3F

SINGH, H. D.
Growth of Endomycopsis Lipolytica on Hydrocarbons,
W72-13817 5A

SINGH, JAYENDRA
Effect of Moisture Stress and Indolebutyric Acid on Rooting of Stem Cuttings of Pomegranate (Punica Granatum L.),
W72-14123 3F

SINGH, O. S.
Effect of Soil-Moisture Stress on the Lipid Quality of Matured Wheat Grains,
W72-14155 3F

SINGH, R. N.
Perpetuation of Bacterial Blight Disease of Paddy and Preservation of Its Incitant: I. Survival of Xanthomonas Oryzae in Water,
W72-14118 5C

SINGH, VIJAI D.
Observations on the Food and Feeding Behavior of the Common Bombay Catfish: Tachysurus Sona (HAM),
W72-14143 2I

SINHA, H.
Inorganic Phosphate Fractions in Calcareous Soils in Relation to Moisture and Incubation Period,
W72-14189 2G

SINHA, RANDHIR
Cropping Pattern in Relation to Well Irrigation,
W72-14150 3F

SKOGERBOE, R. K.
Emission Spectrometric Determination of Trace Amounts of Mercury,
W72-13790 5A

SKOLNIK, H.
A Computerized System for Storing, Retrieving, and Correlating NMR Data,
W72-13808 7C

SMIRNOVA, K. I.
Reduction of Runoff Into Kara-Bogaz-Gol and the Future Level of the Caspian Sea (Ogranicheniye stoka v zaliv Kara-Bogaz-Gol i budushchiy uroven' Kaspiyskogo morya),
W72-14032 2E

SMITH, A. C.
Arazate Method for Estimating Copper in Water,
W72-14191 5A

SMITH, A. J.
Microdetermination of Carbon, Hydrogen, Nitrogen and Oxygen in Petroleum Compounds with an Automatic Elemental Analyzer,
W72-13805 5A

SMITH, J. D.
Hydraulic Design Optimization of the Electrodialysis Process,
W72-14082 3A

SMITH, M. F.
Floating Flexible Skimming Devices,
W72-13891 5G

SMITH, T. P.
Actual Spray Field Operations,
W72-13710 5D

SMITH, V. K.
Recreation Benefit Estimation and Forecasting: Implications of the Identification Problem,
W72-13934 6A

SNOW, H. E.
Harvest and Feeding Habitats of Largemouth Bass (Micropterus Salmoides) in Murphy Flowage, Wisconsin,
W72-14114 8I

SNOW, M.
The River Wear: Inorganic Chemistry Relevant to a Biologist,
W72-13866 2K

SNYDER, M. J.
Factors Affecting the Flexural Strength of Steel Fibrous Concrete,
W72-13754 8F

SOLDAT, J. K.
Concentrations of Zinc-65 in Marine Foodstuffs and Pacific Coastal Residents,
W72-13979 5B

SOMERVILLE, G.
The Influence of Reinforcement Detailing on the Strength of Concrete Structures,
W72-13753 8F

SONIN, AIN A.
A Turbulent Flow Theory of Electrodialysis,
W72-14061 3A

SORENSEN, J. C.
A Framework for Identification and Control of Resource Degradation and Conflict in the Multiple Use of the Coastal Zone,
W72-13906 5G

SORGELOOS, P.
Ecologic Study of Two Small Ponds in the Environs of Wevelgem (West Flanders),
W72-14187 5C

SORMAN, U. A.
Digital Simulation of Thunderstorm Rainfall,
W72-13634 2B

SOULE, D. F.
Preliminary Report on Techniques for Marine Monitoring Systems,
W72-13850 5B

SOULE, J. D.
Preliminary Report on Techniques for Marine Monitoring Systems,
W72-13850 5B

SPAANS, H.
New Methods for Detection and Quantification in Thin-Layer Chromatography: A Study of Pyrolysis and Combustion Systems,
W72-13768 5A

SPASOJEVIC, B. D.
Co-precipitation Applied in the Determination of Lead in Drinking Water, (In Serbo-Croatian),
W72-14179 5A

SPEHAR, A. M.
A Re-Evaluation of the Anaerobic Endproducts of Freshwater Fish Exposed to Environmental Hypoxia,
W72-14093 5C

SPIEGLER, D. B.
Four-Dimensional World-Wide Atmospheric Models (Surface to 25 Km Altitude),
W72-13843 2B

SPIEGLER, K. S.
Study of Membrane-Solution Interfaces by Electro-Chemical Methods,
W72-14075 3A

SPOLJARIC, N.
Geology and Ground Water, University of Delaware, Newark, Delaware,
W72-13833 4B

SPOONER, J. A.
Unsteady Flow of Ground Water,
W72-14053 2F

SPROUL, O. J.
Recent Research Results on Virus Inactivation by Water Treatment Processes,
W72-13615 5F

Virus Inactivation by Water Treatment,
W72-13741 5F

SQUIRE, G. R.
Studies on the Mechanisms of Action of the Antitranspirant Phenylmercuric Acetate, and its Penetration into the Mesophyll,
W72-14149 2I

SREENIVASA, M. R.
Evidence for the Eutrophication of Lake Ontario from the Sedimentary Diatom Succession,
W72-13641 5C

SRIVASTAVA, P. K.
2-Amino-4-Methylthiazole as a Reagent for the Gravimetric Determination and Extraction of Mercury (II),
W72-13812 5A

STAGE, A. R.
Strobili Development in Western White Pine: Periodicity, Prediction, and Association with Weather,
W72-14121 2I

STEEL, G.
Rapid Method for Detection and Characterization of Steroids,
W72-13781 5A

STEINER, W. E.
Politics and the Colorado River,
W72-13915 6E

STEVENS, M. A.
Riprapped Basins for Culvert Outfalls,
W72-13751 8A

STILLINGS, B. R.
Chronic Exposure of Rats to Methyl Mercury in Fish Protein,
W72-13780 5C

STOERMER, E. F.
Phytoplankton Assemblage Differences at Inshore Versus Offshore Stations in Lake Michigan, and Their Effects on Nutrient Enrichment Experiments,
W72-13650 5C

STOERMER, EUGENE F.
Nutrients, Phytoplankton Productivity and Species Composition as Influenced by Upwelling in Lake Michigan,
W72-13649 5C

STORR, J. R.
Development of a Theoretical Seasonal Growth Response Curve of Cladophora Glomerata to Temperature and Photoperiod,
W72-13651 5C

STRANDBERG, W. B.
The Allocation of Regional Water Supplies. A Case Study of the Northeastern United States,
W72-13698 6B

STRATHMANN, H.
Control of Concentration Polarization in Reverse Osmosis Desalination of Water,
W72-14080 3A

STRAZDAITE, Y. Y.
Spread of the Orange Lily in the River Valleys of Lithuania,
W72-14168 2I

STRZELECKI, JERZY
The Plankton of Lake Gardno Near the Baltic Sea During the Summer Season,
W72-13637 5C

STUCKY, H. R.
Potentials for Desalting Water in the Tularosa Basin, New Mexico - A Case Study,
W72-14059 3A

STULL, V. R.
Size Distribution of Bacterial Cells,
W72-13667 5A

STUTZENBERGE, F. J.
Cellulolytic Activity in Municipal Solid Waste Composting,
W72-13686 5B

SUKHIJA, P. S.
Effect of Soil-Moisture Stress on the Lipid Quality of Matured Wheat Grains,
W72-14155 3F

SULLIVAN, W. L.
Determination of Diethylstilbestrol in Cattle Tissues,
W72-13677 5A

SUMSION, C. T.
Ground-Water Conditions in Utah, Spring of 1972,
W72-14023 4B

SVOBODOVA, Z.
Some Haematological and Metabolic Changes in Fish Occurring After Pesticide Intoxication (Nektere Hematologicke A Metabolicke Zmenyuryb po Intoxikaci Pesticidy),
W72-13873 5C

SWEENEY, R. A.
Development of a Theoretical Seasonal Growth Response Curve of Cladophora Glomerata to Temperature and Photoperiod,
W72-13651 5C

SWIFT, D. J. P.
Brown and Gray Sands on the Virginia Shelf: Color as a Function of Grain Size,
W72-14017 2J

SZCZEPANSKA, W.
Allelopathy Among the Aquatic Plants,
W72-14130 2I

TAHOUN, S. A.
Amide-Water Interaction on Montmorillonite Surface,
W72-13916 2G

TALINEAU, J. C.
Water Profile Fluctuations Recorded Beneath Some Forage Plants During the Dry Season Using the Neutron Method, (In French),
W72-14138 7B

TANDON, S. N.
2-Amino-4-Methylthiazole as a Reagent for the Gravimetric Determination and Extraction of Mercury (II),
W72-13812 5A

TAYLOR, D.
The Concentrations of Cadmium, Copper, Iron, Manganese, Molybdenum, Nickel, Vanadium and Zinc in Part of the Tropical Northeast Atlantic Ocean,
W72-13985 5A

TAYLOR, H. P. J.
The Influence of Reinforcement Detailing on the Strength of Concrete Structures,
W72-13753 8F

TAYLOR, R. E. L.
The Effects of Increasing Salinity on the Pyramid Lake Fishery,
W72-14054 5C

TESH, R. B.
Natural Population Dynamics of Phlebotomine Sandflies in Panama,
W72-14147 2I

THOMAS, E.
Hypothesis for Dissolved Oxygen Depletion in the Central Basin Hypolimnion of Lake Erie,
W72-13659 5C

THOMAS, R. C.
Water Law--Groundwater Rights in Missouri--A Need for Clarification (Higday V. Nickolaus),
W72-13939 6E

THOMPSON, H.
Ability of Drilling Mud to Lift Bit Cuttings,
W72-13629 8B

THOMPSON, W. E.
Review of California's Regional Water Supply Systems and Possible Applications of Desalting,
W72-13917 3B

THORNE, S. W.
Sensitive Fluorescence Method for the Determination of Chlorophyll a/Chlorophyll b Ratios,
W72-13796 5A

THORUD, D. B.
Development of Forest Management Practices for Increasing Snowpack Water Yield,
W72-13995 2C

Use of Forest Attributes in Snowpack Inventory - Prediction Relationships for Arizona Ponderosa Pine,
W72-13996 2C

THRAILKILL, J.
Carbonate Chemistry of Aquifer and Stream Water in Kentucky,
W72-14004 2F

Digital Computer Modeling of Limestone Groundwater Systems,
W72-14001 2F

THUNBERG, B. E.
Olfaction in Parent Stream Selection by the Alewife (Alosa pseudoharengus),
W72-13675 2I

THURBERG, F. P.
Comparative Effects of Aquatic Biotoxins on Cardiac Systems,
W72-14056 5C

TIETJEN, C.
Statistical Studies on the Relation Between Nitrification and Soil Temperature and Soil Moisture,
W72-14200 2G

TIMM, H.
Cell Size in Russet Burbank Potato Tubers With Various Levels of Nitrogen and Soil Moisture Tensions,
W72-14124 3F

TIWARI, R.
Investigations on Rainy Season Potato in the Plateau Region of Chotanagpur,
W72-14091 3F

TONG, C. S.
Unsteady Flow of Ground Water,
W72-14053 2F

TORRES, G. JR
Sea Water Intrusion: Morro Bay Area, San Luis Obispo County,
W72-13846 2L

TREGUNNA, E. B.
Studies of Moisture Status and Storage Conditions of Spring-Lifted, Mud-Packed Douglas-Fir Seedlings,
W72-14100 2I

TRENBERTH, R. J.
Column Load Influence on Reinforced Concrete-Beam Column Connection,
W72-13748 8F

TRICKETT, E.
Anomalous Water,
W72-13842 1B

TRILLES, JEAN-PAUL
Littoral Oniscoids from the Thau Basin (Mediterranean Littoral Pond): Faunistic and Ecological Study (In French),
W72-14166 2H

TSAI, C. F.
Life History of the Eastern Johnny Darter, Etheostoma Olmstedi Storer, in Cold Tailwater and Sewage-Polluted Water,
W72-13998 5C

TSUNOGAI, S.
Iodine in the Deep Water of the Ocean,
W72-13986 5B

TURNER, V. R.
Mechanical Balance: Electrical Readout Weighing Lysimeter,
W72-14185 7B

TUTHILL, E. J.
Study of Environmental Impacts of Alternative Long Island Sound Bridge Sites,
W72-13907 6G

TWEEDY, B. G.
The Effect of Light and Humidity on Absorption and Degradation of Diphenamid in Tomatoes,
W72-14125 3F

ULRICH, J. T.
Effect of Temperature on the Respiration and Cytochromes of an Extreme Thermophile,
W72-13765 5C

UNRATH, C. R.
The Quality of 'Red Delicious' Apples as Affected by Overtree Sprinkler Irrigation,
W72-14103 3F

VAAS, K. F.
The Fish Fauna of the Estuarine Area of the Rhine and Meuse Rivers,
W72-14153 5B

VADALKAR, K.
Growth of Endomycopsis Lipolytica on Hydrocarbons,
W72-13817 5A

VAN, AS. D.
Environmental Radioactivity at the National Nuclear Research Centre, Pelendaba. Report for the year 1970.
W72-13984 5B

VAN DAMME, J. M. G.
Geohydrological Investigations with a View to Groundwater Catchment--A Case History,
W72-13723 4B

VAN OUWERKERK, J. H.
Application of Models in Geohydrological Investigations,
W72-13731 2A

VAN REES VELLINGA, E.
Buried Channel Aquifers and Present Open Drainage System of East Gelderland, The Netherlands,
W72-13722 2F

VAN RIJN, W. P.
An Electronic Groundwater-Level Detector with Automatic Output Registration,
W72-13729 7B

VANDERBORGH, N. E.
A Study of Phosphate Induced Algal Growth in Order to Suppress or Eliminate this Phenomenon,
W72-13992 5A

VASS, K. K.
Ecology and Production of Salvinia Natans Hiffim; In Kasmir,
W72-14071 2H

VEAL, DENIS M.
A Case of Nutrient Enrichment in an Inshore Area of Georgian Bay,
W72-13662 5C

VECCHIOLI, J.
Experimental Injection of Tertiary-Treated Sewage in a Deep Well at Bay Park, Long Island, N. Y.--A Summary of Early Results,
W72-13839 5B

VEITH, GILMAN D.
PCBs in Fish from the Milwaukee Region,
W72-13652 5C

VERDIN, S. M.
Oil Pollution Control and Fire Extinguishing Apparatus and Method,
W72-13884 5G

VERHEYE, W.
The Use of Aerial Photos in Pedological Cartography of the Area of Transition Between the Tropical Forest and Savanna in the Central Ivory Coast,
W72-14129 7B

VERMA, K. N. P.
Cropping Pattern in Relation to Well Irrigation,
W72-14150 3F

VIETH, W.
Study of Poly (Methacrylates) and Poly (Urethanes) As Reverse Osmosis Membranes. Effect of Water Clustering on Transport Properties,
W72-14076 3A

VLEGGAAR, C. M.
Environmental Radioactivity at the National Nuclear Research Centre, Pelendaba. Report for the year 1970.
W72-13984 5B

VOFSI, D.
Transport Processes in Hyperfiltration Membranes I,
W72-14083 3A

Water Transport in Hyperfiltration Membranes,
W72-14072 3A

VOORHEES, F. R.
Eggs of Floodwater Mosquitoes: XIV. Northern Aedes (Diptera: Culicidae),
W72-14115 2I

VOS, K. D.
Drying Cellulose Acetate Reverse Osmosis Membranes,
W72-14078 3A

WALLACE, J. R.
Digital Simulation of Thunderstorm Rainfall,
W72-13634 2B

WALTER, F.
Recent Developments of Physical Investigations in Boreholes and Wells,
W72-13727 4B

WANG, C. N.
Wax-Bound Lead Dioxide Potentiometric Electrode and Applications to Chelometric Titration,
W72-13676 5A

WATSON, T. G.
The Present Status and Future Prospect of the Turbidostat,
W72-13772 5A

WATTS, F. J.
Riprapped Basins for Culvert Outfalls,
W72-13751 8A

WEAVER, M. L.
Cell Size in Russet Burbank Potato Tubers With Various Levels of Nitrogen and Soil Moisture Tensions,
W72-14124 3F

WEBB, GRAHAME J. W.
Studies on Anuran Water Balance: II. Desiccation in the Australian Frog, Notaden Bennetti,
W72-14133 2I

WEBER, K. J.
An Electronic Groundwater-Level Detector with Automatic Output Registration,
W72-13729 7B

Permeability Distribution in a Holocene Distributary Channel-Fill Near Leerdam (The Netherlands),
W72-13730 2J

WEBER-OLDECOP, D. W.
Water Plant Communities in Eastern Lower Saxony (I and II), (In German),
W72-14117 5C

WELCH, F. M.
Sewage Treatment Apparatus and Method,
W72-13893 5D

WELCH, G. R.
Techniques for Preventing Differential-Pressure Sticking of Drill Pipe,
W72-13618 8C

WELLISCH, H.
A Survey of Indexing and Abstracting Services for Water Resources Engineering,
W72-13820 10B

WELLS, G. J.
Skeleton Weed (Chondrilla Juncea) in the Victorian Mallee: V. Chemical Fallowing,
W72-13708 3F

WENG, P. S.
Strontium-90 and Cesium-137 in Canned Seafood, Taiwan, Republic of China, 1970-1971,
W72-13990 5A

WESSELING, J.
The Use of Geohydrology in Solving Water Management Problems in Agriculture,
W72-13726 4B

WESTERMAN, R. L.
Sulfuric Acid: Its Potential for Improving Irrigation Water Quality,
W72-13920 5G

WHITTON, B. A.
The River Wear: Inorganic Chemistry Relevant to a Biologist,
W72-13866 2K

WIGGERT, J. M.
Roughness Elements as Energy Dissipators of Free-Surface Flow in Circular Pipes,
W72-13747 8B

WILLEY, R. L.
Drought Resistance in Subalpine Nymphs of Somatochlora Semicircularis Solys (Odonata: Corduliidae),
W72-14183 2I

WILLIAMS, C. H.
Reaction of Surface-Applied Superphosphate with Soil: I. The Fertilizer Solution and its Initial Reaction With Soil,
W72-14198 5B

WILLIAMS, P. W.
Morphometric Analysis of Polygonal Karst in New Guinea,
W72-14018 2J

WILSON, W. S.
An Experimental Study of the Growth of Mechanically Generated Surface Water Waves When Subjected to a Fully Developed Turbulent Channel Airflow,
W72-13734 2E

WINDHAM, R. L.
Simple Device for Compensation of Broad-Band Absorption Interference in Flameless Atomic Absorption Determination of Mercury,
W72-13803 5A

WINTER, E. J.
Contamination of Lettuce Irrigated with Sewage Effluent,
W72-14104 5B

WINTHRODE, D. E.
A Study of the Disposal of the Effluent from a Large Desalination Plant,
W72-14086 5B

WIRAHADIKUSUMAH, S.
Development of Lactic Acid Bacteria During Early Stages of Fermentation in Fish Silage,
W72-13683 5A

WIT, S. L.
Endosulfan in the Rhine River,
W72-13847 5C

WOLFE, N. H.
Extracting Oil Waste,
W72-13888 5D

WOOD, G. B.
A Simple Means of Detaching Tree Shoots Under Water for Physiological Study,
W72-14096 2I

WOODALL, P. F.
Notes on a Rhodesian Colony of the Red Bishop,
W72-14142 2I

WOODRUFF, K. D.
General Ground-Water Quality in Fresh-Water Aquifers of Delaware,
W72-13832 5B

Geology and Ground Water, University of Delaware, Newark, Delaware,
W72-13833 4B

WROBEL, JAN-PETER
Hydrogeological Studies in the Captation Area of the Loisach River Between Garmisch-Partenkirchen and Eschenlohe/OBB,
W72-14148 2E

WUNDERLICH, C. R.
Operation of Reverse Osmosis Pilot Plants,
W72-14074 3A

YARON, D.
Soil Water Regime in Economic Evaluation of Salinity in Irrigation,
W72-13932 3C

YASHOUV, A.
Interaction Between the Common Carp (Cyprinus Carpio) and the Silver Carp (Hypothalamichthys Molitrix) in Fish Ponds,
W72-14112 8I

YATES, R. A.
Effects of Environmental Conditions and the Coadministration of Growth Retardants on the Response of Sugarcane to Foliar Treatment with Gibberellin,
W72-13924 3F

YEE, W. C.
Thermal Aquaculture: Engineering and Economics,
W72-13743 6B

YEH, W. W. G.
Nonsteady Flow in a Recharge Well-Unconfined Aquifer System,
W72-13828 2F

YOSHIMOTO, A.
Microcracking Effect on Flexural Strength of Concrete After Repeated Loading,
W72-13744 8F

YOUNG, D. R.
Mussels and Barnacles as Indicators of the Variation of Manganese-54, Cobalt-60 and Zinc-65 in the Marine Environment,
W72-13978 5B

ZAEBST, K.
Chlorinated Hydrocarbon, Microparticulate Effects on Microorganisms Isolated from Lake Erie,
W72-13999 5C

ZAERR, J. B.
Moisture Stress and Stem Diameter in Young Douglas-Fir,
W72-14098 2I

ZAGAR, J. B.
An Automated Liquid Chromatographic Method for the Determination of Tetracycline Antibiotics,
W72-13669 5A

ZAMFIR, G.
The Effect of Certain Chlorinated Organic Pesticides on Hygienic Indicators of Water,
W72-14164 5C

ZANKAI, NORA P.
The Horizontal Distribution of Rotifera Plankton in Lake Balaton,
W72-14163 5C

ZEILMAKER, D. A.
Application of Models in Geohydrological Investigations,
W72-13731 2A

ZEITOUN, M. A.
A Study of the Disposal of the Effluent from a Large Desalination Plant,
W72-14086 5B

ZERGERSON, E.
Influence of Strongly Bound Counter-Ions on Permselective Membranes,
W72-14073 3A

ZEVULUM, M.
Influence of Strongly Bound Counter-Ions on Permselective Membranes,
W72-14073 3A

ZHOLDAKOVA, Z. I.
Hygienic Standardization of Phenol in Water Bodies (In Russian),
W72-14157 5F

ZOROMSKI, D. W.
Spectrophotometric Method for Determining Low Levels of Water-Soluble Boron in Fertilizers,
W72-13782 5A

ZUTSHI, D. P.
Ecology and Production of Salvinia Natans Hiffim; In Kasmir,
W72-14071 2H

ORGANIZATIONAL INDEX

ACADEMIA R. S. R., BUCHAREST. INSTITUTUL DE BIOLOGIE.
Competition and Its Bearing on the Freshwater Faunas,
W72-14176 2I

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, PA.
A Re-Evaluation of the Anaerobic Endproducts of Freshwater Fish Exposed to Environmental Hypoxia,
W72-14093 5C

ADVISORY SERVICE, EXETER (ENGLAND). AGRICULTURAL DEVELOPMENT.
Contamination of Lettuce Irrigated with Sewage Effluent,
W72-14104 5B

AEROJET-GENERAL CORP., EL MONTE, CALIF.
Operation of Reverse Osmosis Pilot Plants,
W72-14074 3A

Biological Degradation of Cellulose Acetate Reverse Osmosis Membranes,
W72-14079 3A

AEROVAC CORP., PHILADELPHIA, PA. (ASSIGNEE)
Vacuum Distillation Process and Apparatus with Direct Air Contact Condensing for Desalination of Water,
W72-13882 3A

AGRICULTURAL RESEARCH INST., RANCHI (INDIA).
Investigations on Rainy Season Potato in the Plateau Region of Chotanagpur,
W72-14091 3F

AGRICULTURAL RESEARCH SERVICE, BELTSVILLE, MD. ENTOMOLOGY RESEARCH DIV.
Sandwich KBr Disk for Scanning Volatile Pesticides,
W72-13811 5A

AGRICULTURAL RESEARCH SERVICE, BELTSVILLE, MD. SOILS LAB.
Identification of Organochlorine Pesticide Residues by Ultraviolet Solid-Phase Photolysis,
W72-13786 5A

AGRICULTURAL RESEARCH SERVICE, ORLANDO, FLA. ENTOMOLOGY RESEARCH DIV.
A Device for Measuring and Recording the Amount and Duration of Free Water on Vegetation in the Field,
W72-14094 3F

AGRICULTURAL RESEARCH SERVICE, SIDNEY, MONT.
Seedbed Preparation and Seeding Methods to Establish Grassed Waterways,
W72-13914 4A

AGRICULTURAL STABILIZATION AND CONSERVATION SERVICE, WASHINGTON, D.C. CONSERVATION AND LAND USE PROGRAMS.
Rural Environmental Assistance Program (Draft Environmental Impact Statement).
W72-13953 5G

Water Bank Program (Draft Environmental Impact Statement).
W72-13959 6G

AKADEMIYA NAUK LITOVSKOI SSR, VILNIUS. INST. OF BOTANY.
Spread of the Orange Lily in the River Valleys of Lithuania,
W72-14168 2I

AKADEMIYA NAUK SSSR, LENINGRAD. INSTITUT EVOLYUTSIONNOI FIZIOLOGII I BIOKHIMII.
Functional Model of the Lake Ecological System (In Russian),
W72-14167 5C

AKADEMIYA NAUK SSSR, MOSCOW. INST. OF ANIMAL MORPHOLOGY.
Regularities of Sr90 and Cs137 Circulation in Different Links of Food Chain in Zoocoenosis,
W72-13801 5B

AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT MIKROBIOLOGII.
Effect of Pumping Freshwaters Into Oil Strata of the Perm Prikamje on the Distribution of Microflora, (In Russian),
W72-14135 5C

AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT ORGANICHESKOI KHIMII.
On Calculation of the Areas of Off-Chart Chromatographic Peaks Using Data Obtained with the Aid of Integrators,
W72-13769 7B

AKADEMIYA NAUK SSSR, MOSCOW. OKEANOGRAFICHESKAYA KOMISSIYA.
New Investigations of Shore Processes (Novyye issledovaniya beregovykh protsessov).
W72-14036 2J

AKADEMIYA NAUK SSSR, MOSCOW. POCHVENNYI INSTITUT.
Origin of Saline Soils and Their Regime, Volume 2,
W72-14041 3C

AKADEMIYA NAUK SSSR, YAKUTSK. INSTITUT GEOLOGII.
Platinum Minerals in Quaternary Sediments Between the Anabar and Olenek Rivers (Platinovyye mineraly chetvertichnykh otlozheniy Anabaro-Olenekskogo mezhdurech'ya),
W72-14035 2J

AKADEMIYA NAUK URSR, KIEV. INSTYTUT ZOOLOGII.
Present State of Castor Fiber L. Population in the Upper and Middle Flow of the Ubort River and Prospects of Its Economic Use (In Russian),
W72-14159 2I

ALABAMA MARINE RESOURCES LAB., DAUPHIN ISLAND.
Hydrology of Alabama Areas--Cooperative Gulf of Mexico Estuarine Inventory,
W72-13840 5B

ALASKA UNIV., COLLEGE. INST. OF MARINE SCIENCE.
Distribution Patterns for Some Particulate and Dissolved Trace Metals Within an Active Glacial Fjord,
W72-13973 5B

ALASKA UNIV., COLLEGE. INST. OF WATER RESOURCES.
The Biodegradation of Organic Substrates Under Arctic and Subarctic Conditions,
W72-13822 5C

ALBERTA UNIV., EDMONTON. DEPT. OF BOTANY.
Oil and the Ecology of the Arctic,
W72-14188 5C

ALEXANDRIA INST. OF OCEANOGRAPHY AND FISHERIES (EGYPT).
Tilapia Fishery in Lake Maruit: Age and Growth of Tilapia Nilotica L. In The Lake,
W72-14000 2H

Reproduction of Tilapia Nilotica L.,
W72-14042 8I

ALL-UNION RESEARCH INST. OF MARINE GEOLOGY AND GEOPHYSICS, RIGA (USSR).
Development of the Gauya River Valley (Razvitiye doliny reki Gauya),
W72-14034 2J

ALLIED CHEMICAL CORP., IDAHO FALLS, IDAHO.
Exploratory Study of Brine Disposal Using Fluid-Bed Evaporation,
W72-14063 5E

ALLIED RESEARCH ASSOCIATES, INC., BALTIMORE, MD. BALTIMORE DIV.
Four-Dimensional World-Wide Atmospheric Models (Surface to 25 Km Altitude),
W72-13843 2B

ALLIS CHALMERS MFG. CO., MILWAUKEE, WIS. (ASSIGNEE).
Sewage Treatment Apparatus and Method,
W72-13893 5D

AMERICAN CYANAMID CO., PEARL RIVER, N.Y. LEDERLE LABS.
An Automated Liquid Chromatographic Method for the Determination of Tetracycline Antibiotics,
W72-13669 5A

AMERICAN MUSEUM OF NATURAL HISTORY, NEW YORK.
Pollutant Concentrations in Abnormal Young Terns from Long Island Sound,
W72-14134 5C

AMICON CORP., LEXINGTON, MASS.
Control of Concentration Polarization in Reverse Osmosis Desalination of Water,
W72-14080 3A

AMSTERDAM WATER WORKS (NETHERLANDS).
Fresh Water Winning and Salt Water Encroachment in the Amsterdam Dune Water Catchment Area,
W72-13724 4B

ANTIOCH COLL., YELLOW SPRINGS, OHIO.
A Continuously Monitored Respiration Chamber for Fish,
W72-13872 5A

ARGONNE NATIONAL LAB., ILL.
Radionuclide Concentrations Near the Big Rock Point Nuclear Power Station,
W72-13661 5C

ARIZONA STATE MUSEUM, TUCSON.
Man--The Desert Farmer,
W72-13919 3F

ARIZONA UNIV., TUCSON. DEPT. OF AGRICULTURAL CHEMISTRY AND SOILS.
Sulfuric Acid: Its Potential for Improving Irrigation Water Quality,
W72-13920 5G

ARIZONA UNIV., TUCSON. DEPT. OF DAIRY AND FOOD SCIENCES.
Evaluation of Methods for Detection of Coliform Bacteria in Raw Milk,
W72-13671 5A

ARIZONA UNIV., TUCSON. DEPT. OF WATERSHED MANAGEMENT.
The Recreational Value of a Small Reservoir in an Arid Environment,
W72-13994 6D

Development of Forest Management Practices for Increasing Snowpack Water Yield,
W72-13995 2C

Use of Forest Attributes in Snowpack Inventory - Prediction Relationships for Arizona Ponderosa Pine,
W72-13996 2C

ARIZONA UNIV., TUCSON. ENVIRONMENTAL RESEARCH LAB.
Controlled-Environment Vegetable Production: Results of Trials at Puerto Penasco, Mexico, 1968-1970,
W72-13926 3F

ARIZONA WATER COMMISSION, PHOENIX.
Politics and the Colorado River,
W72-13915 6E

ARKANSAS POLLUTION CONTROL COMMISSION, LITTLE ROCK.
Air Code and Water Quality Criteria for Interstate Streams for State of Arkansas.
W72-14044 6E

ARMY ENGINEER DISTRICT, BUFFALO, N.Y.
Sandusky Harbor, Erie County, Ohio (Draft Environmental Impact Statement).
W72-13950 5G

Fairport Harbor, Lake County, Ohio (Draft Environmental Impact Statement).
W72-13961 4A

Lorain Harbor, Ohio (Maintenance) (Draft Environmental Impact Statement).
W72-13962 4A

ARMY ENGINEER DISTRICT, CHARLESTON, S.C.
Kingstree Branch Flood Control Project, South Carolina (Draft Environmental Impact Statement).
W72-13960 4A

Little River Inlet, North Carolina and South Carolina, Navigation Improvements (Draft Environmental Impact Statement).
W72-13964 4A

ARMY ENGINEER DISTRICT, FORT WORTH, TEX.
Laneport, North Fork and South Fork Lakes, San Gabriel River, Texas (Draft Environmental Impact Statement).
W72-13956 8A

ARMY ENGINEER DISTRICT, NEW ORLEANS, LA.
Red River Waterway and Red River Waterway Emergency Bank Protection, Mississippi River to Vicinity of Index, Arkansas, Louisiana, Arkansas, Oklahoma, and Texas (Draft Environmental Impact Statement).
W72-13952 8A

ARMY ENGINEER DISTRICT, NEW YORK.
Aquatic Plant Control Program, Hudson and Mohawk Rivers, New York (Final Environmental Impact Statement).
W72-13967 4A

ARMY ENGINEER DISTRICT, PORTLAND, OREG.
Lost Creek Lake Project, Rogue River, Oregon (Draft Environmental Impact Statement).
W72-13965 8D

ARMY ENGINEER DISTRICT, ST. LOUIS, MO.
Dively Drainage and Levee District (District 23), Illinois (Draft Environmental Impact Statement).
W72-13955 8D

ARMY ENGINEER DISTRICT, ST. PAUL, MINN.
Diked Disposal Area Program, Duluth-Superior Harbor, St. Louis County, Minnesota and Douglas County, Wisconsin (Draft Environmental Impact Statement).
W72-13954 5G

ARMY ENGINEER DISTRICT, WALLA WALLA, WASH.
Stuart Gulch Dam, Idaho (Final Environmental Impact Statement).
W72-13968 8D

ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.
Investigation of Sinking Methods for Removal of Oil Pollution from Water Surfaces. Phase II. Methods of Test for Laboratory Evaluation of Oil Sinking Materials,
W72-13702 5G

Model Studies of Outfall Systems for Desalination Plants (Part II - Estuary Models),
W72-14064 5B

ARMY MEDICAL RESEARCH UNIT, PANAMA, APO NEW YORK 09826.
Natural Population Dynamics of Phlebotomine Sandflies in Panama,
W72-14147 2I

ASSIUT UNIV. (EGYPT). DEPT. OF CHEMISTRY.
Spectrophotometric Determination of Trace Quantities of Iron (III) by an Exchange Reaction with Metal Acetylacetonates,
W72-13793 5A

ATMOSPHERIC ENVIRONMENT SERVICE, TORONTO (ONTARIO).
Mechanical Balance: Electrical Readout Weighing Lysimeter,
W72-14185 7B

ATOMIC ENERGY BOARD, PRETORIA (SOUTH AFRICA).
Environmental Radioactivity at the National Nuclear Research Centre, Pelendaba. Report for the year 1970.
W72-13984 5B

AUSCOTENG LTD., ADELAIDE (AUSTRALIA) (ASSIGNEE).
Distillation Apparatus for Desalinisation of Saline Water to Recover Fresh Water as Condensate,
W72-13897 3A

AUSTRALIAN NATIONAL UNIV., CANBERRA. DEPT. OF FORESTRY.
A Simple Means of Detaching Tree Shoots Under Water for Physiological Study,
W72-14096 2I

BABES-BOLYAI UNIV., CLUJ (RUMANIA).
Aspects of the Nutritive Dynamics and Trophic Relationships of the Burbot (Lota Lota Lota L.) in the Upper Mures River, (In Rumanian),
W72-14127 2H

BATELLE MEMORIAL INST., COLUMBUS, OHIO. COLUMBUS LABS.
Factors Affecting the Flexural Strength of Steel Fibrous Concrete,
W72-13754 8F

BATTELLE MEMORIAL INST., RICHLAND, WASH.
Hanford Atomic Products Operation, January-December 1969.
W72-13991 5B

BATTELLE-PACIFIC NORTHWEST LABS. RICHLAND, WASH.
Concentrations of Zinc-65 in Marine Foodstuffs and Pacific Coastal Residents,
W72-13979 5B

BATTELLE-PACIFIC NORTHWEST LABS., RICHLAND, WASH. RADIOLOGICAL SCIENCES DEPT.
Transport and Depletion of Radionuclides in the Columbia River,
W72-13975 5B

BAYERISCHE AKADEMIE DER WISSENSCHAFTEN, MUNICH (WEST GERMANY).
Hydrogeological Studies in the Captation Area of the Loisach River Between Garmisch-Partenkirchen and Eschenlohe/OBB,
W72-14148 2E

BEDFORD INST., DARTMOUTH (NOVA SCOTIA). ATLANTIC OCEANOGRAPHIC LAB.
Sampling and Spatial Distribution of Benthonic Foraminifera,
W72-13674 5A

BEMIDJI STATE COLL., MINN.
Patterns of Lakeshore Usage Around Lake Bemidji,
W72-14131 5C

BHABHA ATOMIC RESEARCH CENTRE, BOMBAY (INDIA). HEALTH PHYSICS DIV.
Anomalous Th228/Th232 and Th230/232 Activity Ratios in Backwater Sediments Along the West Coast of India.
W72-13982 5B

BISHOP (WILLIAM), TALAHASSEE, FLA.
Engineering Design Criteria for Spray Irrigation,
W72-13709 5D

BRITISH COLUMBIA FORESTRY SERVICE, VICTORIA; AND DEPARTMENT OF THE ENVIRONMENT VICTORIA (BRITISH COLUMBIA).
The Kinetics of Water Absorption in Stratifying and Nonstratifying Noble Fir (Abies Procera Rehd.) Seeds,
W72-14099 2I

BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF BOTANY.
Studies of Moisture Status and Storage Conditions of Spring-Lifted, Mud-Packed Douglas-Fir Seedlings,
W72-14100 2I

BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF SOIL SCIENCE.
Psychrometric Apparatus for Bowen-Ratio Determination Over Forests,
W72-14184 7B

BRITISH COLUMBIA UNIV., VANCOUVER. DEPT. OF ZOOLOGY.
A Guide to the External Sexing of Some West African Freshwater Fishes,
W72-14145 2I

BROOM'S BARN EXPERIMENT STATION, BURY ST. EDMONDS (ENGLAND).
Effects of Cultural Practices and Fertilizers on Sugar Beet Quality,
W72-14139 5C

BUNDESGESUNDHEITSAMT, BERLIN (WEST GERMANY). INSTITUT FUER WASSER-, BODEN-, UND LUFTHYGIENE.
W72-13864 5C

BUREAU OF RECLAMATION, SALT LAKE CITY, UTAH. REGION 4.
Authorized China Meadows Dam and Reservoir Lyman Project, Wyoming (Draft Environmental Impact Statement).
W72-13963 8D

BUREAU OF SOLID WASTE MANAGEMENT, CINCINNATI, OHIO.
Cellulolytic Activity in Municipal Solid Waste Composting,
W72-13686 5B

BUREAU OF WATER HYGIENE, CINCINNATI, OHIO.
The Coliform Test: A Criterion for the Viral Safety of Water,
W72-13612 5F

BUZZARDS BAY CORP., MARION, MASS. (ASSIGNEE).
Apparatus for Measuring Properties of a Fluid Body from an Airborne Vehicle,
W72-13876 7B

CAIRO INST. OF OCEANOGRAPHY AND FISHERIES (EGYPT).
The Biology and Fishery of Mugil Saliens (Risso) in Lake Quarun, U. A. R.,
W72-14107 2H

CALIFORNIA STATE DEPT. OF AGRICULTURE, SACRAMENTO. PESTICIDE ADVISORY COMMITTEE.
A Review of Pesticide Monitoring Programs in California.
W72-14043 7B

CALIFORNIA STATE DEPT. OF FISH AND GAME, SACRAMENTO.
Fish and Wildlife in the Marine and Coastal Zone, Part A, Summary Planning Information, and Recommendations,
W72-13908 6G

Harvest, Survival, and Cost of Two Domestic Strains of Tagged Rainbow Trout Stocked in Lake Berryessa, California,
W72-14181 2H

CALIFORNIA STATE DEPT. OF WATER RESOURCES, SACRAMENTO.
Sea Water Intrusion: Morro Bay Area, San Luis Obispo County,
W72-13846 2L

California High Water, 1969-1970,
W72-14013 2E

CALIFORNIA UNIV., BERKELEY.
Properties of Seawater and Its Concentrates and Related Solutions at Temperatures up to 400 Degrees F,
W72-14062 1B

CALIFORNIA UNIV., BERKELEY. DEPT. OF CHEMISTRY.
Rapid Method for Detection and Characterization of Steroids,
W72-13781 5A

CALIFORNIA UNIV., BERKELEY. DEPT. OF GEOLOGY AND GEOPHYSICS.
Weathering of Basaltic Tephra on the Island of Hawaii,
W72-14014 2J

CALIFORNIA UNIV., BERKELEY. DEPT. OF LANDSCAPE ARCHITECTURE.
A Framework for Identification and Control of Resource Degradation and Conflict in the Multiple Use of the Coastal Zone,
W72-13906 5G

CALIFORNIA UNIV., BERKELEY. SEA WATER CONVERSION LAB.
Study of Membrane-Solution Interfaces by Electro-Chemical Methods,
W72-14075 3A

CALIFORNIA UNIV., LOS ANGELES.
Nonsteady Flow in a Recharge Well-Unconfined Aquifer System,
W72-13828 2F

CALIFORNIA UNIV., LOS ANGELES. GRADUATE SCHOOL OF MANAGEMENT.
Extensions of Mathematical Programming for Regional Water Quality Management,
W72-13931 5G

CANADIAN WILDLIFE SERVICE, SAINTE-FOY (QUEBEC).
The Spartina Tidal Marshes of the St. Lawrence Estuary and Their Importance to Aquatic Birds,
W72-14128 2L

CANISIUS COLL., BUFFALO, N.Y.
Concentration of Mercury in the Manufacture of Fish Protein Concentrate by Isopropyl Alcohol Extraction of Sheepshead and Carp,
W72-13869 5C

CASE WESTERN RESERVE UNIV., CLEVELAND, OHIO. SYSTEMS ENGINEERING DIV.
A Multilevel Approach to Determining Optimal Taxation for the Abatement of Water Pollution,
W72-13935 5G

CEMENT AND CONCRETE ASSOCIATION, LONDON (ENGLAND).
The Influence of Reinforcement Detailing on the Strength of Concrete Structures,
W72-13753 8F

CEMENTATION CO. LTD., CROYDON (ENGLAND).
Small Diameter Sand Drains,
W72-13756 8D

CENTER OF ORNITHOLOGY IN THE RHONE ALPS, LYON (FRANCE).
Seasonal Variations in the Avifauna Composition of the Lavours Swamp (AIN),
W72-13799 2I

CENTRAL INLAND FISHERIES RESEARCH INST., BARRACKPORE (INDIA).
Observations on the Food and Feeding Behavior of the Common Bombay Catfish: Tachysurus Sona (HAM),
W72-14143 2I

CHANUTE TECHNICAL TRAINING CENTER, CHANUTE AFB, ILL.
Efficiency of Sucrose Flotation in Recovering Insect Larvae From Benthic Stream Samples,
W72-14116 2I

CLARKSON COLL. OF TECHNOLOGY, POTSDAM, N.Y. DEPT. OF CHEMISTRY.
Complexation of Metal Ions with Natural Polyelectrolytes (Removal and Recovery of Metal Ions from Polluted Waters),
W72-13776 5A

CLEMSON UNIV., S.C. WATER RESOURCES RESEARCH INST.
Water Quality Predictions Based on Limnological Parameters,
W72-13825 5C

Removal of Impurities from Trickling Filter Effluents by Coagulation,
W72-13826 5D

COLORADO STATE UNIV., FORT COLLINS; AND IDAHO UNIV., MOSCOW.
Riprapped Basins for Culvert Outfalls,
W72-13751 8A

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF AGRICULTURAL ENGINEERING.
Future Water Use Model of Utah Valley,
W72-13928 4A

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF BOTANY AND PLANT PATHOLOGY.
Lodgepole Pine-Dwarf Mistletoe Xylem Water Potentials,
W72-14119 2I

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF CHEMISTRY.
Emission Spectrometric Determination of Trace Amounts of Mercury,
W72-13790 5A

COLORADO STATE UNIV., FORT COLLINS. DEPT. OF CIVIL ENGINEERING.
Techniques of Statistical Evaluation of Runoff Results of Precipitation Modification,
W72-13841 2A

Test of Runoff Increase Due To Precipitation Management for the Colorado River Basin Pilot Project,
W72-13912 3B

Perturbation Analysis of Two-Phase Infiltration,
W72-14006 2G

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, ASPENDALE (AUSTRALIA). DIV. OF ATMOSPHERIC PHYSICS.
An Instrument for Continuous Recording of Natural Evaporation,
W72-14136 7B

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CANBERRA (AUSTRALIA). DIV. OF ENVIRONMENTAL MECHANICS.
Improved Thermocouple Psychrometer for the Measurement of Plant and Soil Water Potential: II. Operation and Calibration,
W72-14120 7B

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CANBERRA (AUSTRALIA). DIV. OF LAND RESEARCH.
An Improved Soil Water Flux Sensor,
W72-14192 7B

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CANBERRA (AUSTRALIA). DIV. OF PLANT INDUSTRY.
Sensitive Fluorescence Method for the Determination of Chlorophyll a/Chlorophyll b Ratios,
W72-13796 5A

Reaction of Surface-Applied Superphosphate with Soil: I. The Fertilizer Solution and its Initial Reaction With Soil,
W72-14198 5B

Reaction of Surface-Applied Superphosphate with Soil: II. Movement of the Phosphorus and Sulphur into the Soil,
W72-14199 5B

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, MELBOURNE (AUSTRALIA). DIV. OF FOREST PRODUCTS.
Variation in the Toxicity of Arsenic Compounds to Microorganisms and the Suppression of the Inhibitory Effects by Phosphate,
W72-13813 5C

COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, WEMBLEY (AUSTRALIA).
Redistribution of Soil Water After Infiltration,
W72-14197 2G

CONNECTICUT UNIV., STORRS. DEPT. OF ANIMAL INDUSTRIES.
Arazate Method for Estimating Copper in Water,
W72-14191 5A

CONTINENTAL OIL CO., PONCA CITY, OKLA.
Techniques for Preventing Differential-Pressure Sticking of Drill Pipe,
W72-13618 8C

CORNELL UNIV., ITHACA, N.Y.
Oxygen Uptake and Mechanism of Substrate Purification in a Model Trickling Filter,
W72-13697 5D

The Allocation of Regional Water Supplies. A Case Study of the Northeastern United States,
W72-13698 6B

A Statistical Analysis of Base-Flow Flood Discharge Data,
W72-13700 2E

CORNELL UNIV., ITHACA, N.Y. DEPT. OF CHEMISTRY.
On-Line Computer-Controlled Electrical Detection in Spark Source Mass Spectrometry,
W72-13770 7B

Precision of Electrical Detection Measurements of Powdered Samples in Spark Source Mass Spectrometry,
W72-13787 5A

CORNELL UNIV., ITHACA, N.Y. DEPT. OF NATURAL RESOURCES.
Five Trace Elements and Vitamin B-12 in Cayuga Lake,
W72-13660 5C

CORPS OF ENGINEERS, ANCHORAGE, ALASKA.
Flood Plain Information, Talkeetna River-Susitna River-Chulitna River, Talkeetna, Alaska.
W72-13836 4A

DALHOUSIE UNIV., HALIFAX (NOVA SCOTIA). INST. OF OCEANOGRAPHY.
The Annual Cycle in Quantity and Composition of the Zooplankton of the Sargasso Sea Off Bermuda. II. The Surface to 2,000 m,
W72-13775 5B

DAWKINS AND ASSOCIATES, INC., ORLANDO, FLA.
Some Aspects of Effluent Landspreading,
W72-13712 5D

DEFENSE DOCUMENTATION CENTER, ALEXANDRIA, VA.
Salmonella.
W72-13800 5C

DELAWARE GEOLOGICAL SURVEY, NEWARK.
General Ground-Water Quality in Fresh-Water Aquifers of Delaware,
W72-13832 5B

Geology and Ground Water, University of Delaware, Newark, Delaware,
W72-13833 4B

Nitrate Contamination of the Water-Table Aquifer in Delaware,
W72-13834 5B

Ground-Water Geology of the Delaware Atlantic Seashore,
W72-13835 2F

DELTA INST. OF HYDROBIOLOGICAL RESEARCH, YERSEKE (NETHERLANDS).
The Fish Fauna of the Estuarine Area of the Rhine and Meuse Rivers,
W72-14153 5B

DEPARTMENT OF ENERGY MINES AND RESOURCES, BURLINGTON (ONTARIO). CANADA CENTRE FOR INLAND WATERS.
W72-13655 5C

The Effect of DDT and Dieldrin Upon C-14 Uptake by in Situ Phytoplankton in Lakes Erie and Ontario,
W72-13657 5C

Electrodialysis: A Method for Extracting Available Nutrients in Great Lakes Sediments,
W72-13658 5C

A Survey of Housewives' Attitudes,
W72-13664 5C

Symposium: Public Involvement in the Water Management Problems in the Great Lakes,
W72-13665 5C

DEPARTMENT OF THE INTERIOR, WASHINGTON, D.C.
Program Statement for the Proposed Prototype Oil Shale Leasing Program (Draft Environmental Impact Statement).
W72-13969 3E

DESALTING SYSTEMS AND SERVICES, INC., FORT LAUDERDALE, FLA.
V.T.E. Desalting Plant, St. Croix, U.S. Virgin Islands Analysis of Operational Data,
W72-14058 3A

DEUTSCHER WETTERDIENST, BRUNSWICK (WEST GERMANY).
Statistical Studies on the Relation Between Nitrification and Soil Temperature and Soil Moisture,
W72-14200 2G

DIAMOND SHAMROCK CHEMICAL CO., BALTIMORE, MD. CHEMETALS DIV.
Determination of Fluoride in Vegetation Using the Specific Ion Electrode,
W72-13789 5A

DOW CHEMICAL CO., MIDLAND, MICH.
A Study of the Disposal of the Effluent from a Large Desalination Plant,
W72-14086 5B

DOW CHEMICAL CO., MIDLAND, MICH. (ASSIGNEE).
Process for Treating Water with a Polyhalide Resin Using a Semipermeable Membrane Barrier,
W72-13887 5F

DOW CHEMICAL CO., MIDLAND, MICH. FUNCTIONAL PRODUCTS AND SYSTEMS.
A Literature Search and Critical Analysis of Biological Trickling Filter Studies-Vol. I.
W72-13638 5D

A Literature Search and Critical Analysis of Biological Trickling Filter Studies - Vol II.
W72-13639

DU PONT DE NEMOURS (E. I.) AND CO., WILMINGTON, DEL. (ASSIGNEE).
Desalination Apparatus and Process of Manufacture Using Improved, Acid Grafted Nitrogenous Membranes,
W72-13886 3A

DURHAM UNIV. (ENGLAND).
The River Wear: Inorganic Chemistry Relevant to a Biologist,
W72-13866 2K

EAST CENTRAL FLORIDA REGIONAL PLANNING COUNCIL, WINTER PARK.
Proceedings of the Land Spreading Conference at Orlando, Florida on July 15, 1971.
W72-13704 5D

EASTMAN KODAK CO., ROCHESTER, N.Y. RESEARCH LABS.
Determination of Submicrogram Amounts of Boron Using the B-10 (n, alpha) Li-7 Reaction,
W72-13784 5A

EDGEWOOD ARSENAL, MD.
Analytical Uses of Charge-Transfer Complexation: Spectrophotometric Method for Iodide in Water,
W72-13792 5A

ENGINEERING ENTERPRISES, INC., HOUSTON, TEX.
New Pipe Configuration Reduces Wall Sticking,
W72-13633 8A

ENVIROGENICS CO., EL MONTE, CALIF.
Optimization of Dissolved Oxygen Measurements,
W72-14066 5A

ENVIROMETRICS, INC., WASHINGTON, D.C.
The River Basin Model: Chairman and Council.
W72-13930 6A

ENVIRONMENTAL PROTECTION AGENCY, CINCINNATI, OHIO. WATER QUALITY OFFICE.
Removal of Viruses from Water and Wastewater,
W72-13613 5F

ENVIRONMENTAL PROTECTION AGENCY, DALLAS, TEX. AIR AND WATER PROGRAMS DIV.
Award of P.L. 660 Grant for Construction of Wastewater Treatment Facilities and Outfall Sewers--Project No. WPC-TEX-722 (Draft Environmental Impact Statement).
W72-13949 5D

ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C. OFFICE OF WATER PROGRAMS.
Radiation Data, (Section II - Water).
W72-13988 5A

Radiation Data, (Section II - Water).
W72-13989 5A

ENVIRONMETRICS, INC., WASHINGTON, D. C.
The River Basin Model: The Social Science Laboratory.
W72-13929 6A

EOTVOS LORAND UNIV., BUDAPEST (HUNGARY). INST. FOR SYSTEMATIC ZOOLOGY.
Studies on the Course of Litter Decomposition in a Hungarian Quercetum-Petraeae-Cerris Forest Stand,
W72-14165 4A

EUROPEAN NUCLEAR ENERGY AGENCY, PARIS (FRANCE); AND ORGANIZATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT PARIS (FRANCE).
Radioactive Waste Management Practices in Western Europe.
W72-13983 5G

FEDERAL BIOLOGICAL INST. FOR LAND AND FORESTRY, BERLIN (WEST GERMANY). INST. FOR PLANT PRESERVATION RESEARCH.
Thin-Layer Chromatographic-Enzymatic Identification of Some Lindane- and Possible DDT-Metabolites as well as Pentachlorophenol, (Dunnschichtchromatographisch-Enzymatischer Nachweis Einiger Lindan-Und Theoretisch Moglicher DDT-Metaboliten Sowie Von Pentachlorphenol),
W72-13760 5A

FEDERAL INST. FOR LIPID RESEARCH, MUENSTER (WEST GERMANY).
New Methods for Detection and Quantification in Thin-Layer Chromatography: A Study of Pyrolysis and Combustion Systems,
W72-13768 5A

FIELD STATION FOR THE INVESTIGATION OF LOCUSTS, BIKANER (INDIA).
Effect of Soil Moisture on the Phase Characters of Hatchlings in the Desert Locust, Schistocerca Gregaria Forsk,
W72-14092 2I

FISH CULTURE RESEARCH STATION, DOR (ISRAEL).
Interaction Between the Common Carp (Cyprinus Carpio) and the Silver Carp (Hypothalamichthys Molitrix) in Fish Ponds.
W72-14112 8I

FISHERIES RESEARCH BOARD OF CANADA, WEST VANCOUVER BRITISH COLUMBIA). PACIFIC ENVIRONMENT INST.
Thermal Effluents from Electrical Power Generation,
W72-13905 5C

FLORIDA DEPT. OF NATURAL RESOURCES, TALLAHASSEE. BUREAU OF GEOLOGY.
Environmental Geology and Hydrology, Tallahassee Area, Florida.
W72-13740 6D

FLORIDA TECHNOLOGICAL UNIV., ORLANDO. DEPT. OF CIVIL ENGINEERING AND ENVIRONMENTAL SCIENCES.
Basic Principles of Advanced Waste Treatment,
W72-13705 5D

FLORIDA UNIV., GAINESVILLE. DEPT. OF AGRICULTURAL ENGINEERING.
Wastewater Renovation at Tallahassee - Experimental Studies,
W72-13711 5D

FLORIDA UNIV., GAINESVILLE. DEPT. OF PATHOLOGY.
Studies on the Determination of Physiological Levels of Chromium in Serum by Gas Chromatography,
W72-13767 5A

FLORIDA UNIV., GAINESVILLE. DEPT. OF SOIL SCIENCE.
Plants and Wastewater Renovation,
W72-13707 5D

FORAS TALUNTAIS, DRUMBOYLAN (IRELAND).
An Analysis of the Rainfall Variations in County Leitrim and Their Influence on Agricultural Production,
W72-13713 3F

FOREST PRODUCTS LAB., MADISON, WIS.
Spectrophotometric Method for Determining Low Levels of Water-Soluble Boron in Fertilizers,
W72-13782 5A

FOREST SERVICE (USDA), OGDEN, UTAH. INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION.
Strobili Development in Western White Pine: Periodicity, Prediction, and Association with Weather,
W72-14121 2I

FORESTRY OFFICE, ATHERTON (AUSTRALIA).
A Hand-Augering Method of Installing Access Tubing for Neutron Moisture Meters,
W72-14194 7B

FUKUSHIMA UNIV. (JAPAN). DEPT. OF EARTH SCIENCE.
Relation of Precipitation to Soil Temperature (2nd Report)--Effect of Soil Moisture on Heat-Exchange in the Soil,
W72-13845 2G

FUTURE PRODUCTS DEVELOPMENT CORP., MCLEAN, VA. (ASSIGNEE).
Acceleration Units,
W72-13880 5D

GEOLOGICAL SURVEY, ALBANY, N.Y.
Limnology of Oneida Lake with Emphasis on Factors Contributing to Algal Blooms,
W72-13851 5C

GEOLOGICAL SURVEY, AUSTIN, TEX.
Records of Wells in Harris County, Texas, 1892-1972,
W72-14027 4B

GEOLOGICAL SURVEY, EL PASO, TEX.
Development of Ground Water in the El Paso District, Texas, 1963-70,
W72-14029 2F

GEOLOGICAL SURVEY, LAKEWOOD, COLO.
Selected Streamflow Characteristics as Related to Channel Geometry of Perennial Streams in Colorado,
W72-13736 2E

GEOLOGICAL SURVEY, LITTLE ROCK, ARK.
Use of Water in Arkansas, 1970,
W72-14028 6D

GEOLOGICAL SURVEY, MENLO PARK, CALIF.
Water-Quality Reconnaisance of the Lower Santa Ana River Canyon, Southern California,
W72-13720 2K

Limnological Studies of Big Bear Lake, California,
W72-13739 5C

River Discharge into an Ice-Covered Ocean and Related Sediment Dispersal, Beaufort Sea, Coast of Alaska,
W72-14020 2J

Chemical Factors that Influence the Availability of Iron and Manganese in Aqueous Systems,
W72-14022 5B

Growth of a Talus Cone in the Western Chugach Mountains, Alaska,
W72-14026 2J

GEOLOGICAL SURVEY, MINEOLA, N.Y.
Experimental Injection of Tertiary-Treated Sewage in a Deep Well at Bay Park, Long Island, N. Y.--A Summary of Early Results,
W72-13839 5B

GEOLOGICAL SURVEY, MORGANTOWN, W. VA.
Geological Considerations of Sanitary Landfill Site Evaluations,
W72-13719 5B

GEOLOGICAL SURVEY OF CANADA, OTTAWA (ONTARIO).
Permafrost in Canada.
W72-13831 7C

GEOLOGICAL SURVEY OF PUERTO RICO, SAN JUAN.
Flooding Along the Rio Piedras in the San Juan Area, Puerto Rico,
W72-13714 7C

GEOLOGICAL SURVEY, PARKVILLE, MD.

GEOLOGICAL SURVEY, PARKVILLE, MD.
Ground-Water Occurrence in the Maryland Piedmont,
W72-13848 2F

GEOLOGICAL SURVEY, ROLLA, MO. WATER RESOURCES DIV.
Groundwater Resources of Saline County, Missouri,
W72-14011 2F

GEOLOGICAL SURVEY, SALT LAKE CITY, UTAH.
Ground-Water Conditions in Utah, Spring of 1972,
W72-14023 4B

GEOLOGICAL SURVEY, TACOMA, WASH.
Test-Observation Well Near Davenport, Washington: Description and Preliminary Results,
W72-13733 4B

GEOLOGICAL SURVEY, UNIVERSITY, ALA.
Water for Alabama, The Alabama Water-Resources Spectrum--Second Progress Report,
W72-14024 5G

GEOLOGICAL SURVEY, WASHINGTON, D.C.
Ground Water in Kearny County, Southwestern Kansas,
W72-13715 7C

Ground-Water Resources of McLean County, West-Central North Dakota,
W72-13716 7C

Prehistoric Near-Surface Subsidence Cracks in Western Freshno County, California,
W72-13717 2E

Electric Analog Studies of Flow to Wells in the Punjab Aquifer of West Pakistan,
W72-13735 2F

Water Quality of Streams in the Neshaminy Creek Basin, Pennsylvania,
W72-13737 2K

Surface Water Supply of the United States, 1961-65, Part 1. North Atlantic Slope Basins--Volume 2. Basins from New York to Delaware.
W72-13827 7C

Estimated Use of Water in the United States in 1970,
W72-13829 6D

Ground-Water Outflow from Chino Basin, Upper Santa Ana Valley, Southern California,
W72-13838 2F

GEOLOGISCHES LANDESAMT HAMBURG (WEST GERMANY).
Contribution to the Geochemistry of Groundwater in Northern Germany,
W72-13725 2K

GEORGIA INST. OF TECH., ATLANTA. ENVIRONMENTAL RESOURCES CENTER.
Digital Simulation of Thunderstorm Rainfall,
W72-13634 2B

GEORGIA UNIV., ATHENS. DEPT. OF HORTICULTURE.
Transpiration of Antirrhinum Majus L. 'Panama' as Influenced by Soil Temperature,
W72-14102 2D

GHENT RIJKSUNIVERSITEIT (BELGIUM). LABORATORIUM VOOR FYSIOLOGISCHE SCHEIKUNDE.
The Use of Aerial Photos in Pedological Cartography of the Area of Transition Between the Tropical Forest and Savanna in the Central Ivory Coast,
W72-14129 7B

GHENT RIJKSUNIVERSITEIT (BELGIUM). LABORATORIUM VOOR OECOLOGIE.
Ecologic Study of Two Small Ponds in the Environs of Wevelgem (West Flanders),
W72-14187 5C

GIDROMETEOROLOGICHESKII NAUCHNO-ISSLEDOVATELSKII TSENTR, LENINGRAD (USSR).
Reduction of Runoff Into Kara-Bogaz-Gol and the Future Level of the Caspian Sea (Ogranicheniye stoka v zaliv Kara-Bogaz-Gol i budushchiy uroven' Kaspiyskogo morya),
W72-14032 2E

Calculation of Rate of Extension of Ice Cover in Afterbays of Reservoirs (Raschet nastupleniya kromki ledyanogo pokrova v nizhikh b'yefakh vodokhranilishch),
W72-14033 2C

GOSUDARSTVENNYI GIDROLOGICHESKII INSTITUT, LENINGRAD (USSR).
Channel Network of a Basin and Formation of Runoff (Ruslovaya set' basseyna i protsess formirovaniya stoka vody),
W72-13853 2E

GRONINGEN RIJKSUNIVERSITEIT (NETHERLANDS). PHYSICS LAB.
Application of Natural Isotopes in Ground Water Hydrology,
W72-13728 2F

GULF COAST WATER HYGIENE LAB., DAUPHIN ISLAND, ALA.
Enteric Viruses in Ground and Surface Waters: A Review of their Occurrence and Survival,
W72-13611 5F

GULF ENERGY AND ENVIRONMENTAL SYSTEMS, INC., SAN DIEGO, CALIF.
Reverse Osmosis Membrane Module (Spiral-Wound Concept),
W72-14069 3A

GULF GENERAL ATOMIC CO., SAN DIEGO, CALIF.
Drying Cellulose Acetate Reverse Osmosis Membranes,
W72-14078 3A

Reverse Osmosis Membrane Module (Spiral Wound Concept),
W72-14087 3A

GULF RESEARCH AND DEVELOPMENT CO., PITTSBURGH, PA.
Design and Operation of Jet-Bit Programs for Maximum Hydraulic Horsepower, Impact Force or Jet Velocity,
W72-13626 8C

HACH CHEMICAL CO., AMES, IOWA. (ASSIGNEE)
Method and Means for Detecting Coliform Bacteria in Water,
W72-13881 5A

HARVARD UNIV., CAMBRIDGE, MASS. COOLIDGE CHEMICAL LAB.
Characterization of Gas Chromatographic Effluents Via Scanning Fluorescence Spectrometry,
W72-13672 5A

HEBREW UNIV., JERUSALEM (ISRAEL). DEPT. OF IRRIGATION.
Sprinkle and Trickle Irrigation of Green Pepper in an Arid Zone,
W72-14089 3F

Sprinkle, Furrow and Trickle Irrigation of Muskmelon in an Arid Zone,
W72-14090 3F

The Effect of Distance from the Tricklers on Soil Salinity and Growth and Yield of Sweet Corn in an Arid Zone,
W72-14105 3F

Emergence, Early Growth, and Salinity of Five Vegetable Crops Germinated by Sprinkle and Trickle Irrigation in an Arid Zone,
W72-14106 3F

HELSINKI UNIV. (FINLAND). ZOOLOGICAL MUSEUM.
Observations on the Mercury Content of Myoxocephalus Quadricornis (L.) (Teleostei, Cottidae) in Finland,
W72-13695 5B

HERCULES RESEARCH CENTER, WILMINGTON, DEL.
A Computerized System for Storing, Retrieving, and Correlating NMR Data,
W72-13808 7C

HOKKAIDO UNIV., SAPPORO (JAPAN). DEPT. OF CHEMISTRY.
Iodine in the Deep Water of the Ocean,
W72-13986 5B

HONEYWELL RESEARCH CENTER, HOPKINS, MINN.
Versatile Colorimetric Coulometer,
W72-13802 2K

HUMBLE OIL AND REFINING CO., HOUSTON, TEX.
Analytical Determination of Optimum Bit Weight and Rotary Speed Combinations,
W72-13619 8C

HUNTINGDON RESEARCH CENTRE (ENGLAND). DEPT. OF METABOLIC STUDIES AND ORGANIC SYNTHESIS.
A Modified Plastic Bag Combustion Technique for the Radioassay of C-14 and H-3 in Biological Tissues,
W72-13670 5A

IBARAKI UNIV., MITO (JAPAN). FACULTY OF AGRICULTURE.
On Nitrogen Forms in Dew or Frost Water: II. On the Changes of Nitrogen Dioxide in the Air, (In Japanese),
W72-14186 5B

IIT RESEARCH INST. CHICAGO, ILL.
Application of Inorganic Ion Exchange MEMBRANES TO Electrodialysis,
W72-14081 3A

ILLINOIS STATE GEOLOGICAL SURVEY, URBANA.
Geologic Cross Sections Derived from Seismic Profiles and Sediment Cores from Southern Lake Michigan,
W72-13844 2J

ILLINOIS UNIV., CHICAGO. DEPT. OF BIOLOGICAL SCIENCES.
Drought Resistance in Subalpine Nymphs of Somatochlora Semicircularis Solys (Odonata: Corduliidae),
W72-14183 2I

ILLINOIS UNIV., URBANA. DEPT. OF CIVIL ENGINEERING.
A Probabilistic Analysis of Dissolved Oxygen-Biochemical Oxygen Demand Relationship in Streams,
W72-13688 5B

Theory of Stochastic Modeling of Watershed Systems,
W72-14007 2A

ILLINOIS UNIV., URBANA. DEPT. OF ENTOMOLOGY.
Eggs of Floodwater Mosquitoes: XIV. Northern Aedes (Diptera: Culicidae),
W72-14115 2I

IMANCO LTD., ROYSTON (ENGLAND).
The Quantimet 720P for Routine Biological Assay and Potency Calculation from Colony Count, Inhibition and Exhibition Zone Measurements,
W72-13762 5B

INDIANA STATE BOARD OF HEALTH, INDIANAPOLIS; AND INDIANA STREAM POLLUTION CONTROL BOARD, INDIANAPOLIS.
Indiana Water Quality, 1969, Monitor Station Records--Rivers and Streams.
W72-14045 7B

INSTITUT NATIONAL DE LA RECHERCHE AGRONOMIQUE, CLERMONT-FERRAND (FRANCE). STATION D'AGRONOMIE.
The Main Physico-Chemical Characteristics of Soils of the Vertisal and Sodium-Containing Type in the Rochefort Marsh at St-Laurent-De-La-Pree (Maritime Charente, France),
W72-14190 2G

INSTITUT NATIONAL DE LA RECHERCHE AGRONOMIQUE, PARIS (FRANCE).
The Soils of the Wooded District of the Southeastern Morne Department: Soil Formation and General Data on Water Management,
W72-13918 2G

INSTITUT PASTEUR, PARIS (FRANCE).
Epidemiological and Ecological Aspects Due to the Construction of River Weirs in the Tropical Regions,
W72-13819 5C

INSTITUTE FOR LAND AND WATER MANAGEMENT RESEARCH WAGENINGEN (NETHERLANDS).
The Use of Geohydrology in Solving Water Management Problems in Agriculture,
W72-13726 4B

INSTITUTE OF MARINE RESEARCH, HELSINKI (FINLAND).
Dynamics of Phytoplankton Primary Production and Biomass in Loviisa Archipelago (Gulf of Finland),
W72-13871 5C

INSTITUTE OF RURAL SCIENCE, ABERYSTWYTH (WALES). ANALYTICAL LAB.
Variation of Precision with Time for Autoanalyzer Data,
W72-13763 7B

INSTITUTO DE ASUNTOS NUCLEARES, BOGOTA (COLOMBIA).
Neutron-Activation Determination of Vanadium in Oils and Catalysts,
W72-13804 5A

INSTITUTUL AGRONOMIC, BUCHAREST (RUMANIA).
Yield and Water Consumption of the Plants Grown in Pots as Influenced by Soil Structure, (In Rumanian),
W72-14173 2G

INTERNATIONAL CONFERENCE OF BENZOLE PRODUCERS, PARIS (FRANCE).
Gas Liquid Chromatographic Analysis of Hydrocarbon Mixtures. A Report on the Work of the International Conference of Benzole Producers,
W72-13771 5A

INTERNATIONAL LAB. OF MARINE RADIOACTIVITY, MONTE CARLO (MONACO).
Adsorption-Desorption Equilibria of Some Radionuclides in Sediment-Freshwater and Sediment-Seawater Systems,
W72-13974 5B

IOWA STATE UNIV., AMES.
Growth of the Fathead Minnow (Pimephales Promelas) in Tertiary Treatment Ponds,
W72-13868 5C

IOWA STATE UNIV., AMES. ENGINEERING RESEARCH INST.
Alluvial Cutoff Dating from Subsequent Growth of a Meander,
W72-14025 2J

IOWA UNIV., IOWA CITY.
Pesticide and Mercury Levels in Migrating Duck Populations,
W72-13865 5C

ISTITUTO BIOCLIMATOL. OSPEDALE MARE, LIDO, VENICE (ITALY).
On Some Modifications in the Venetian Climate During the Last Thirty Years: Repercussions of the Phenomenon of Flood Waters,
W72-13757 2B

JAPAN ATOMIC ENERGY RESEARCH INST., OSAKA.
Studies on the Behaviours and Distribution of Radioactive Substances in Coastal and Estuarine Waters,
W72-13976 5B

JAWAHARLAL NEHRU AGRICULTURAL UNIV., JABALPUR (INDIA).
A Note on the Response of the Rice Varieties to Varying Water Levels,
W72-14152 3F

JEFFERSON CHEMICAL CO., INC., AUSTIN, TEX. AUSTIN LABS.
Simple Device for Compensation of Broad-Band Absorption Interference in Flameless Atomic Absorption Determination of Mercury,
W72-13803 5A

JOHNS HOPKINS UNIV., BALTIMORE, MD. CHESAPEAKE BAY INST.
An Experimental Study of the Growth of Mechanically Generated Surface Water Waves When Subjected to a Fully Developed Turbulent Channel Airflow,
W72-13734 2E

Design and Siting Criteria for Once-Through Cooling Systems Based on a First-Order Thermal Plume Model,
W72-14030 5C

JOHNS HOPKINS UNIVERSITY, BALTIMORE, MD. CHESAPEAKE BAY INST.
A Device for Collecting In-Situ Samples of Suspended Sediment for Microscopic Analysis,
W72-13693 5A

KANSAS UNIV., LAWRENCE. DEPT. OF SYSTEMATICS AND ECOLOGY.
Changes in Plankton Species Composition and Diversity in a Controlled Nutrient Enrichment Study,
W72-13816 5C

KAZAN STATE UNIV., (USSR).
Certain Features of Respiratory Metabolism of Plants Under Conditions of an Increasing Water Deficiency, (In Russian)
W72-14195 3F

KEENE CORP., NEW YORK (ASSIGNEE).
Control System for Waste Water Treatment Plants,
W72-13895 5D

KENT STATE UNIV., OHIO. DEPT. OF BIOLOGICAL SCIENCES.
A Quantitative Comparison of Pigment Extraction by Membrane and Glass-Fiber Filters,
W72-13673 5A

KENTUCKY UNIV., LEXINGTON. DEPT. OF GEOLOGY.
Carbonate Chemistry of Aquifer and Stream Water in Kentucky,
W72-14004 2F

KENTUCKY WATER RESOURCES INST., LEXINGTON.
Digital Computer Modeling of Limestone Groundwater Systems,
W72-14001 2F

KIEV RESEARCH INST. OF GENERAL COMMUNAL HYGIENE (USSR).
Hygienic Standardization of Phenol in Water Bodies (In Russian),
W72-14157 5F

KONINKLIJKE NEDERLANDSCHE HEIDEMAATSCHAPPIJ, ARNHEM (NETHERLANDS).
Application of Models in Geohydrological Investigations,
W72-13731 2A

KONINKLIJKE-SHELL EXPLORATIE EN PRODUKTIE LABORATORIUM, RIJSWIJK (NETHERLANDS).
Permeability Distribution in a Holocene Distributary Channel-Fill Near Leerdam (The Netherlands),
W72-13730 2J

KONINKLIJKE-SHELL EXPLORATIE EN PRODUKTIE LABORATORIUM, RIJSWIJK (NETHERLANDS). AN ELECTRONIC GROUNDWATER-LEVEL DETECTOR WITH AUTOMATIC OUTPUT REGISTRATION,
An Electronic Groundwater-Level Detector with Automatic Output Registration,
W72-13729 7B

LABORATORY FOR RESEARCH FISH. DIS., NIR DAWID (ISRAEL).
Preliminary Observations of Superintensive Fish Culture in the Beith-Shean Valley in 1969-1970,
W72-14111 8I

Fisheries and Fish Culture in Israel in 1970,
W72-14113 8I

LAKE ERIE BASIN OFFICE, FAIRVIEW PARK, OHIO.
Hypothesis for Dissolved Oxygen Depletion in the Central Basin Hypolimnion of Lake Erie,
W72-13659 5C

LANCASTER UNIV., BAILRIGG (ENGLAND). DEPT. OF BIOLOGICAL SCIENCES.
Studies on the Mechanisms of Action of the Antitranspirant Phenylmercuric Acetate, and its Penetration into the Mesophyll,
W72-14149 2I

LANTBRUKHOGSKOLAN, UPPSALA (SWEDEN). DEPT. OF MICROBIOLOGY.
Development of Lactic Acid Bacteria During Early Stages of Fermentation in Fish Silage,
W72-13683 5A

LEEDS UNIV. (ENGLAND). WELLCOME MARINE LAB.
Seasonal Variation of the Suspended Solid Matter, Off the Coast of North Yorkshire,
W72-13682 5B

LILLY (ELI) AND CO., GREENFIELD, IND. GREENFIELD LABS.
Determination of Diethylstilbestrol in Cattle Tissues,
W72-13677 5A

LIMNOLOGISCHE FLUSS STATION, SCHLITZ (WEST GERMANY).
Observations on the Oxygen Needs of Some Species of European Plecoptera,
W72-13874 5C

LINDE A.G., HOLLRIEGELSKREUTH (WEST GERMANY) (ASSIGNEE).
Process and Apparatus for Obtaining Fresh Water from Saline Water,
W72-13892 3A

LIVERPOOL POLYTECHNIC (ENGLAND).
Some Observations on the Food of the Gwyniad Coregonus Clupeoides pennantii Valenciennes of Llyn Tegid (Lake Bala), North Wales,
W72-13738 2H

LIVERPOOL UNIV., (ENGLAND). DEPT. OF OCEANOGRAPHY.
The Concentrations of Cadmium, Copper, Iron, Manganese, Molybdenum, Nickel, Vanadium and Zinc in Part of the Tropical Northeast Atlantic Ocean,
W72-13985 5A

LOUISIANA STATE UNIV., BATON ROUGE. DEPT. OF GEOLOGY.
The Genesis of Selected Hydrochemical Facies in Baton Rouge, Louisiana, Ground Waters,
W72-14008 2F

MADAGASCAR UNIV., TANANARIVE. LAB. OF ZOOLOGY.
Analysis of the Environmental Factors in the Area of Distribution of Chalarodon Madagascariensis: Their Biological Implications,
W72-14144 2I

MAGNET COVE BARIUM CORP., HOUSTON, TEX.
Which Lost-Circulation Materials to Use ... And How to Use Them,
W72-13621 8G

MAGYAR TUDOMANYOS AKADEMIA, TIHANY. BIOLOGICAL RESEARCH INST.
The Influence of Zala River on the Bacteriological Condition in Keszthely-Bay (Lake Balaton),
W72-14154 5C

Cladocera Studies on Lake Balaton: IV. Subfossil Remains in the Sediments of Lake Balaton II,
W72-14160 2H

Glass Effect and the Microbial Plankton-Seston Relation in the Water of Lakes Balaton and Belso,
W72-14161 5C

The Horizontal Distribution of Rotifera Plankton in Lake Balaton,
W72-14163 5C

MAIN GEOPHYSICAL OBSERVATORY, LENINGRAD (USSR).
Snowfall and Snow Transport During Snowstorms Over the USSR,
W72-13852 2C

Estimating the Wetting of Walls by Driving Rain (Ob otsenke uvlazheniya sten pri kosykh dozhydakh),
W72-13855 7B

MAINE UNIV., ORONO.
Recent Research Results on Virus Inactivation by Water Treatment Processes,
W72-13615 5F

MAINE UNIV., ORONO. DEPT. OF CIVIL ENGINEERING.
Virus Inactivation by Water Treatment,
W72-13741 5F

MAINZ UNIV. (WEST GERMANY). INSTITUT FUER ANORGANISCHE CHEMIE UND KERNCHEMIE.
Metabolism of Polychlorinated Norbornenes by Clostridium butyricum,
W72-13779 5B

MAIZE RESEARCH STATION, CHHINDWARA (INDIA).
Effect of Irrigating Wheat Crop at Different Stages,
W72-14151 3F

MANITOBA UNIV., WINNIPEG.
Activity Response to Chlorine in the Brook Trout, Salvelinus Fontinalis (Mitchell),
W72-13867 5C

MARINE BIOLOGICAL ASSOCIATION OF THE UNITED KINGDOM, PLYMOUTH (ENGLAND). LAB.
Horizontal and Vertical Distribution of the Interstitial Harpacticoid Copepods of a Sandy Beach,
W72-13783 5C

MARYLAND FISH AND WILDLIFE ADMINISTRATION, ANNAPOLIS.
Tidal Variation of the Suspended Sediment Size Distribution at a Station in Upper Chesapeake Bay,
W72-13837 2L

Suspended Sediment Data Summary March 1966-May 1967, Upper Chesapeake Bay (Tolchester to Havre De Grace),
W72-13849 2L

MARYLAND STATE DEPT. OF HEALTH AND MENTAL HYGIENE, BALTIMORE.
Responsibility for Plant Operations,
W72-13742 5F

MARYLAND UNIV., COLLEGE PARK. WATER RESEARCH CENTER.
A Survey of Indexing and Abstracting Services for Water Resources Engineering,
W72-13820 10B

MARYLAND UNIV., SOLOMONS. NATURAL RESOURCES INST.
Effects of Temperature on the Respiratory Metabolism of Three Chesapeake Bay Bivalves,
W72-13997 5C

Life History of the Eastern Johnny Darter, Etheostoma Olmstedi Storer, in Cold Tailwater and Sewage-Polluted Water,
W72-13998 5C

MASCHINENFABRIK AUGSBURG-NUERNBERG A.G., ESSEN (WEST GERMANY).
Ion Exchange Apparatus for Treating Liquids,
W72-13885 3A

MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
Study of Poly (Methacrylates) and Poly (Urethanes) As Reverse Osmosis Membranes. Effect of Water Clustering on Transport Properties,
W72-14076 3A

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. DEPT. OF CIVIL ENGINEERING.
Dynamics of Flood Frequency,
W72-14003 2E

MASSACHUSETTS INST. OF TECH., CAMBRIDGE. DEPT. OF NUTRITION AND FOOD SCIENCE.
Chronic Exposure of Rats to Methyl Mercury in Fish Protein,
W72-13780 5C

MASSACHUSETTS INST. OF TECH., CAMBRIDGE, MASS.
A Turbulent Flow Theory of Electrodialysis,
W72-14061 3A

MASSACHUSETTS INST. OF TECH., LEXINGTON. LINCOLN LAB.
Tunable Infrared Laser Spectroscopy of Atmospheric Water Vapor,
W72-13732 2B

MEKOROTH WATER CO., TEL-AVIV (ISRAEL). RESEARCH DIV.
Engineering and Economic Evaluation of the Reliability of Water Supply,
W72-13936 6D

METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, ILL. (ASSIGNEE).
Method and Apparatus for Use in the Activated Sludge Treatment of Sewage,
W72-13901 5D

MICHIGAN DEPT. OF NATURAL RESOURCES, LANSING. BUREAU OF WATER MANAGEMENT.
Radioactivity in Lake Michigan Water and Biota Vicinity of Big Rock Point Nuclear Reactor, 1960-69,
W72-13656 5C

MICHIGAN UNIV., ANN ARBOR. DEPT. OF WATER RESOURCES.
Interpretation of Tracer Tests on Sedimentation Tanks,
W72-13696 5D

MICHIGAN UNIV., ANN ARBOR. GREAT LAKES RESEARCH DIV.
Nutrients, Phytoplankton Productivity and Species Composition as Influenced by Upwelling in Lake Michigan,
W72-13649 5C

Phytoplankton Assemblage Differences at Inshore Versus Offshore Stations in Lake Michigan, and Their Effects on Nutrient Enrichment Experiments,
W72-13650 5C

MICROBIOLOGICAL RESEARCH ESTABLISHMENT, SALISBURY (ENGLAND).
Hypertrophic Growth,
W72-13668 5C

MIDWEST RESEARCH INST., KANSAS CITY, MO.
An Experimental Study of the Structure, Thermodynamics and Kinetic Behavior of Water,
W72-14060 1B

MINISTRY OF AGRICULTURE, CAIRO (EGYPT); CAIRO UNIV., GIZA (EGYPT). FACULTY OF AGRICULTURE; AND CAIRO UNIV., GIZA (EGYPT). DEPT. OF SOILS.
Effect of Land use Period on Soil Properties,
W72-13922 2G

MINISTRY OF AGRICULTURE, CAIRO (EGYPT). SOILS DEPT.
Water and Some Nutrients Losses by Deep Percolation as Influenced by the Depth of Water Table,
W72-13923 2G

MINISTRY OF AGRICULTURE, FISHERIES AND FOOD, LOWESTOFT (ENGLAND). FISHERIES RADIOBIOLOGICAL LAB.
The Evaluation of Public Radiation Exposure from the Controlled Marine Disposal of Radioactive Waste (With Special Reference to the United Kingdom),
W72-13977 5B

MINISTRY OF AGRICULTURE, ZAGAZIG (EGYPT). SOIL SCIENCE DEPT.
Amide-Water Interaction on Montmorillonite Surface,
W72-13916 2G

MISSOURI DEPT. OF CONSERVATION, JEFFERSON CITY.
A Distributional Study of Missouri Fishes,
W72-13910 2I

MISSOURI UNIV., COLUMBIA. DEPT. OF PLANT PATHOLOGY.
The Effect of Light and Humidity on Absorption and Degradation of Diphenamid in Tomatoes,
W72-14125 3F

MONTANA STATE UNIV., BOZEMAN. DEPT. OF BOTANY AND MICROBIOLOGY.
Effect of Temperature on the Respiration and Cytochromes of an Extreme Thermophile,
W72-13765 5C

MONTPELLIER UNIV. (FRANCE). FACULTE DES SCIENCES.
Littoral Oniscoids from the Thau Basin (Mediterranean Littoral Pond): Faunistic and Ecological Study (In French),
W72-14166 2H

MOUND LAB., MIAMISBURG, OHIO.
Detection and Measurement of Tritium by Bremsstrahlung Counting,
W72-13679 5A

MOUNT ALLISON UNIV., SACKVILLE (NEW BRUNSWICK). DEPT. OF BIOLOGY.
Salinity Tolerances of Some Common Prosobranchs,
W72-13795 5C

MOUNT DESERT ISLAND BIOLOGICAL LAB., SALISBURY COVE, ME.
Osmotic Acclimation in the Red River Pupfish, Cyprinodon rubrofluviatilis,
W72-13680 2I

NATIONAL ACADEMY OF SCIENCES-NATIONAL RESEARCH COUNCIL, WASHINGTON, D.C. COMMITTEE ON OCEAN SCIENCES.
Marin Environmental Quality, Suggested Research Programs for Understanding Man's Effect on the Oceans.
W72-13903 5A

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, CLEVELAND, OHIO. LEWIS RESEARCH CENTER.
Effect of Eddy Diffusivity on Wind-Driven Currents in a Two-layer Stratified Lake,
W72-14010 2H

NATIONAL BUREAU OF STANDARDS, WASHINGTON, D.C. ACTIVATION ANALYSIS SECTION.
Method for Determination of Mercury in Biological Materials by Neutron Activation Analysis,
W72-13788 5A

NATIONAL CHEMICAL RESEARCH LAB., PRETORIA (SOUTH AFRICA).
The Present Status and Future Prospect of the Turbidostat,
W72-13772 5A

NATIONAL INST. OF RADIOLOGICAL SCIENCES, NAKAMINATO (JAPAN). MARINE RADIO-ECOLOGICAL RESEARCH STATION.
On The Physico-Chemical Behavior of Radioactive Cerium in Sea Water,
W72-13970 5B

NATIONAL LEAD CO., HOUSTON, TEX. BAROID DIV.
Plan the Mud Program to Reduce Exploration Cost,
W72-13620 8A

NATIONAL TSING HUA UNIV., HSINCHU (TAIWAN). INST. OF PHYSICS.
Strontium-90 and Cesium-137 in Canned Seafood, Taiwan, Republic of China, 1970-1971,
W72-13990 5A

NATIONAL WATER COMMISSION, ARLINGTON, VA.
Authorization of Federal Water Projects (Final Report, Draft Review),
W72-13957 6B

NAVAL CIVIL ENGINEERING LAB., PORT HUENEME, CALIF.
The Biodegradation of Oil in Seawater for Naval Pollution Control,
W72-14012 5B

NAVAL MEDICAL FIELD RESEARCH LAB., CAMP LEJEUNE, N.C.
Evaluation of the Hypoiodous Iodine Tablet - Phase II,
W72-13701 5F

NAVAL MEDICAL RESEARCH UNIT NO. 3, CAIRO (EGYPT). DEPT. OF MEDICAL ZOOLOGY.
A New Reagent for Detecting Tryptophan, Indole, and Indole-3-Acetic Acid in Thin-Layer Chromatography,
W72-13773 5A

NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.
A Study of Light Attenuation in Monterey Bay, California,
W72-13798 5A

NEBRASKA UNIV., LINCOLN. DEPT. OF HORTICULTURE AND FORESTRY.
Simultaneous Determination of Short-Period Photosynthesis and Evapotranspiration,
W72-14009 3F

NEGEV INST. FOR ARID ZONE RESEARCH, BEERSHEVA (ISRAEL).
Influence of Strongly Bound Counter-Ions on Permselective Membranes,
W72-14073 3A

NEVADA UNIV., RENO. CENTER FOR WATER RESOURCES RESEARCH; AND NEVADA UNIV., RENO. DESERT RESEARCH INST.
Transformation of the Tensor Form of Darcy's Law in Inhomogeneous and Anisotropic Soils,
W72-14055 2F

NEVADA UNIV., RENO. DEPT. OF CIVIL ENGINEERING.
Streamflow Synthesis -- A Case Study,
W72-14005 2A

NEVADA UNIV., RENO. MAX C. FLEISCHMANN COLL. OF AGRICULTURE.
The Effects of Increasing Salinity on the Pyramid Lake Fishery,
W72-14054 5C

NEW HAMPSHIRE UNIV., DURHAM. DEPT. OF CHEMISTRY.
The Analysis of Trace Organics in Fresh Water by Gas Chromatography -- Mass Spectroscopy,
W72-14057 5A

NEW HAMPSHIRE UNIV., DURHAM. DEPT. OF ZOOLOGY.
Comparative Effects of Aquatic Biotoxins on Cardiac Systems,
W72-14056 5C

NEW MEXICO AGRICULTURAL EXPERIMENT STATION, UNIVERSITY PARK.
Life History and Ecology of the Gizzard Shad, Dorosoma Cepedianum (Le Sueur) With Reference to Elephant Butte Lake,
W72-13927 2H

NEW MEXICO STATE UNIV., UNIVERSITY PARK.
Disposal of Brine by Solar Evaporation,
W72-14077 2D

NEW MEXICO STATE UNIV., UNIVERSITY PARK. WATER RESOURCES RESEARCH INST.
A Study of Phosphate Induced Algal Growth in Order to Suppress or Eliminate this Phenomenon,
W72-13992 5A

An Integration of the Agricultural Demand Function for Water and the Hydrologic Model of the Pecos Basin,
W72-13993 6D

Potentials for Desalting Water in the Tularosa Basin, New Mexico - A Case Study,
W72-14059 3A

NEW YORK STATE DEPT. OF ENVIRONMENTAL CONSERVATION, ALBANY. ENVIRONMENTAL QUALITY RESEARCH AND DEVELOPMENT UNIT.
Phosphorus in Wastewater,
W72-14046 5B

Biological Denitrification Using Fluidized Granular Beds,
W72-14047 5D

NORSK INSTITUTT FOR VANNFORSKNING, OSLO.
Effect of pH on the Filtration of Aquatic Humus Using Gels and Membranes,
W72-13681 5A

NORTH CAROLINA BOARD OF WATER AND AIR RESOURCES, RALEIGH.
Proposed Reclassifications of Certain Waters in the Broad, Catawba, French Broad, Hiwassee, Little Tennessee, New, and Watauga River Basins to be Considered at a Public Hearing to be Held on June 29, 1972, in Hickory, North Carolina.
W72-13942 5G

NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF HORTICULTURAL SCIENCE.
The Quality of 'Red Delicious' Apples as Affected by Overtree Sprinkler Irrigation,
W72-14103 3F

NORTH CAROLINA WATER RESOURCES RESEARCH INST., RALEIGH.
Swine Waste Characterization and Evaluation of Animal Waste Treatment Alternatives,
W72-13635 5D

Esturine Ecosystems and High Temperatures,
W72-13636 5C

Effects of Land Use on Municipal Watersheds,
W72-13759 4C

NORTHEASTERN WATER HYGIENE LAB., NARRAGANSETT, R.I.
Relative Resistance of Twenty Human Enteric Viruses to Free Chlorine in Potomac Water,
W72-13616 5F

NORTHERN MAINE REGIONAL PLANNING COMMISSION, PRESQUE ISLE.
The Northern Maine Regional Treatment System, Aroostook River-Prestile Stream, A Plan for Clean Water, Summary Report.
W72-14049 5D

OAK RIDGE NATIONAL LAB. NUCLEAR DESALINATION INFORMATION CENTER.
Performance Characteristics of Advanced Evaporator Tubes for Long-Tube Vertical Evaporators (An Addendum),
W72-14068 3A

OAK RIDGE NATIONAL LAB., TENN.
Thermal Aquaculture: Engineering and Economics,
W72-13743 6B

OAK RIDGE NATIONAL LAB., TENN. NUCLEAR DESALINATION INFORMATION CENTER.
Review of California's Regional Water Supply Systems and Possible Applications of Desalting,
W72-13917 3B

O'BRIEN AND GERE, SYRACUSE, N.Y.; AND SYRACUSE-ONONDAGA COUNTY DEPT. OF PUBLIC WORKS, N.Y.
Comprehensive Abatement Program for an Eutrophic Lake,
W72-13663 5C

OCEAN POLLUTION CONTROL, INC., DALLAS, TEX. (ASSIGNEE).
Oil Skimming Apparatus,
W72-13894 5G

OFFICE DE LA RECHERCHE SCIENTIFIQUE ET TECHNIQUE OUTRE-MER, ABIDJAN (IVORY COAST). CENTRE D-ADIOPODOUME.
Water Profile Fluctuations Recorded Beneath Some Forage Plants During the Dry Season Using the Neutron Method, (In French),
W72-14138 7B

OFFICE DE LA RECHERCHE SCIENTIFIQUE ET TECHNIQUE OUTRE-MER, NOSY BE (MADAGASCAR). CENTRE OCEANOGRAPHIQUE (ORSTOM) DE NOSY-BE.
The Hydrological Conditions of Ambaro Bay (Northwestern Madagascar): Contribution to the Study of a Tropical Eutrophic Bay, (In French),
W72-14182 5C

OFFICE OF SALINE WATER, WASHINGTON, D.C.
Proposed Hybrid Prototype Desalting Plant for Brownsville, Texas (Draft Environmental Impact Statement).
W72-13958 3A

Transport Property Requirements of Membranes for Use in Pressure Dialysis Desalination,
W72-14088 3A

OFFICE OF WATER RESOURCES RESEARCH, WASHINGTON, D.C.
Water Resources Research Catalog, Volume Seven.
W72-13617 9C

OHIO STATE UNIV., COLUMBUS.
Chlorinated Hydrocarbon, Microparticulate Effects on Microorganisms Isolated from Lake Erie,
W72-13999 5C

OHIO STATE UNIV., COLUMBUS. COLL. OF BIOLOGICAL SCIENCES.
Effect of Mineral Particulates on Microbial Degradation of Solid Organic Materials,
W72-13645 5C

OKLAHOMA UNIV., NORMAN. DEPT. OF ZOOLOGY; AND MICHIGAN UNIV., ANN ARBOR. GREAT LAKES RESEARCH DIV.
Distribution of Chlorophyll and Its Relation to Particulate Organic Matter in the Offshore Waters of Lake Michigan,
W72-13648 5C

OKLAHOMA WATER RESOURCES RESEARCH INST., STILLWATER.
Economic Efficiency in the Allocation of Irrigation Water Over Time,
W72-13823 6B

OLD DOMINION UNIV., NORFOLK, VA. INST. OF OCEANOGRAPHY.
Brown and Gray Sands on the Virginia Shelf: Color as a Function of Grain Size,
W72-14017 2J

ONTARIO RESEARCH FOUNDATION, SHERIDAN PARK. DEPT. OF PHYSICAL CHEMISTRY.
An Example of Economic Plating Waste Treatment by Reverse Osmosis,
W72-13687 5D

ONTARIO WATER RESOURCES COMMISSION, REXDALE (ONTARIO).
Chlorophyll a - Total Phosphorus Relationships in Lake Erie,
W72-13653 5C

An Intensive Biochemical Survey of Western Lake Erie,
W72-13654 5C

A Case of Nutrient Enrichment in an Inshore Area of Georgian Bay,
W72-13662 5C

OREGON STATE UNIV., CORVALLIS. SCHOOL OF FORESTRY.
Moisture Stress and Stem Diameter in Young Douglas-Fir,
W72-14098 2I

PAN AMERICAN PETROLEUM CORP., TULSA, OKLA.
Squeeze Slurries for Lost Circulation Control,
W72-13622 8G

A New Look at Lost Circulation,
W72-13623 8G

Chemical Removal of Drilled Solids,
W72-13624 8G

Use of Chemicals to Maintain Clear Water for Drilling,
W72-13628 8C

PASSAVANT WERKE (GERMANY) (ASSIGNEE).
Method and Apparatus for Treating Water,
W72-13902 5D

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. DEPT. OF CIVIL ENGINEERING.
Variations in Oxygen Consumption by Aquatic Macrophytes in a Changing Environment,
W72-13646 5C

PHILADELPHIA COMMUNITY COLL., PA.
DDT Residues in Eight California Marine Fishes,
W72-13946 5B

PHILLIPS PETROLEUM CO., BARTLESVILLE, OKLA. (ASSIGNEE).
Fluid Separation,
W72-13890 5G

PITTSBURGH UNIV., PA. DEPT. OF CHEMISTRY.
Voltammetry in Methanol, Ethanol, and Sulfolane as Solvents,
W72-13794 5A

POLISH ACADEMY OF SCIENCES, PSZCZNA. HYDROBIOLOGICAL STATION.
The Plankton of Lake Gardno Near the Baltic Sea During the Summer Season,
W72-13637 5C

POLISH ACADEMY OF SCIENCES, WARSAW. DEPT. OF APPLIED LIMNOLOGY.
Allelopathy Among the Aquatic Plants,
W72-14130 2I

POLISH ACADEMY OF SCIENCES, WARSAW. INST. OF EXPERIMENTAL BIOLOGY.
The Elements of Energy Balance in Grass Carp (Ctenopharyngodonldella Val.): I,
W72-13815 2I

POLYTECHNIC INST. OF BROOKLYN, N.Y.
Continuing Development of a General Mechanistic Theory of Membrane Phenomena and Continuing Experimental and Theoretical Studies of Ion-Exchange Polarization Phenomena,
W72-14085 3A

PORTLAND CEMENT ASSOCIATION, SKOKIE, ILL.; AND IOWA UNIV., IOWA CITY.
Short-Time Deflections of Beams Under Single and Repeated Load Cycles,
W72-13749 8F

PRINCETON UNIV., N.J. DEPT. OF GEOLOGICAL SCIENCES.
Longitudinal Profiles of Ephemeral Streams in Southeastern Arizona,
W72-14021 2E

PROCESS RESEARCH, INC., CAMBRIDGE, MASS.
Hydraulic Design Optimization of the Electrodialysis Process,
W72-14082 3A

PUNJAB AGRICULTURAL UNIV., LUDHIANA (INDIA).
Effect of Soil-Moisture Stress on the Lipid Quality of Matured Wheat Grains,
W72-14155 3F

QUEBEC DEPT. OF TOURISM, MONTREAL. FISH AND GAME WILDLIFE SERVICE RESEARCH LAB.
The Ichthyofauna and Flora of Lake St. Louis on the St. Lawrence River Near Montreal, Quebec: General Features and Recent Changes,
W72-13647 5C

RAJASTHAN UNIV., JAIPUR (INDIA). AGRICULTURAL CHEMISTRY SECTION.
Effect of Saline Waters on the Germination of Watermelon (Citrullus Vulgaris Schrad. ex Eckl. et Zeyh.),
W72-14126 3C

RANCHI UNIV. (INDIA).
Cropping Pattern in Relation to Well Irrigation,
W72-14150 3F

Inorganic Phosphate Fractions in Calcareous Soils in Relation to Moisture and Incubation Period,
W72-14189 2G

REDERI A.B. NORDSTJERNAN, NYNASHAMM (SWEDEN) (ASSIGNEE).
Flow Stabilizing Through Laminar Separation Apparatus,
W72-13877 5D

REGIONAL RESEARCH LAB., JORHAT (INDIA). BIOCHEMISTRY DIV.
Growth of Endomycopsis Lipolytica on Hydrocarbons,
W72-13817 5A

REGIONAL SCIENCE RESEARCH INST., PHILADELPHIA, PA.
Procedures for Estimating the Hydrologic Impact of Urbanization,
W72-14002 4C

RENSSELAER POLYTECHNIC INST., TROY, N.Y.
The Removal of Radionuclides From Water by Hydrous Ferric Oxide,
W72-13699 5D

RESOURCES FOR THE FUTURE, INC., WASHINGTON, D.C.
Recreation Benefit Estimation and Forecasting: Implications of the Identification Problem,
W72-13934 6A

RHODE ISLAND DEPT. OF HEALTH, PROVIDENCE. DIV. OF WATER SUPPLY AND POLLUTION CONTROL.
Report for the 12 Month Period July 1, 1970-June 30, 1971,
W72-14051 5A

RHODE ISLAND UNIV., KINGSTON. GRADUATE SCHOOL OF OCEANOGRAPHY.
Olfaction in Parent Stream Selection by the Alewife (Alosa pseudoharengus),
W72-13675 2I

RICE UNIV., HOUSTON, TEX. DEPT. OF GEOLOGY.
U234/U238 Disequilibrium in Groundwaters of Central Texas,
W72-13971 5B

RIJKSINSTITUUT VOOR DE VOLKSGEZONDHEID, UTRECHT (NETHERLANDS).
Endosulfan in the Rhine River,
W72-13847 5C

The Persistence of Endosulfan in Surface Water,
W72-14193 5B

RIJKSINSTITUUT VOOR DRINKWATERVOORZIENING, THE HAGUE (NETHERLANDS).
Review of Geohydrological Activities in the Netherlands Since World War II, In Particular of the Government Institute for Water Supply,
W72-13721 2F

Geohydrological Investigations with a View to Groundwater Catchment--A Case History,
W72-13723 4B

RIJKSINSTITUUT VOOR VELDBIOLOGISCH ONDERZOEK TEN BEHOEVE VAN HET NATUURBEHOUD, ZEIST (NETHERLANDS).
Additions to the List of Odonata of the Dutch Wadden Islands, with an Account of Water Quality Data of Larval Habitats, and a Review of the Dragonfly Fauna of the Dutch and German Northsea Islands,
W72-14162 2I

RITSUMEIKAN UNIV., KYOTO (JAPAN); AND OSAKA CITY UNIV. (JAPAN).
Microcracking Effect on Flexural Strength of Concrete After Repeated Loading,
W72-13744 8F

ROORKEE UNIV. (INDIA). DEPT. OF CHEMISTRY.
2-Amino-4-Methylthiazole as a Reagent for the Gravimetric Determination and Extraction of Mercury (II),
W72-13812 5A

ROOSEVELT UNIV., CHICAGO, ILL. DEPT. OF CHEMISTRY.
Effect of Cyclamates on the Growth of Pullularia Pullulans,
W72-13814 5C

RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N.J. WATER RESOURCES RESEARCH INST.
Annual Report, Fiscal Year 1970-1971.
W72-13821 9D

SALT RIVER PROJECT, PHOENIX, ARIZ. AGRICULTURAL IMPROVEMENT AND POWER DISTRICT.
Salt River Project 1971 Annual Report.
W72-13913 4A

SAN DIEGO STATE COLL., CALIF.; AND NORTHWESTERN UNIV., EVANSTON, ILL.
Analysis of Uncertainty in Settlement Prediction,
W72-13745 8D

SCIENCE SPECTRUM, INC., SANTA BARBARA, CALIF.
Size Distribution of Bacterial Cells,
W72-13667 5A

SECRETARY OF AGRICULTURE, WASHINGTON, D.C.
Reverse Osmosis System,
W72-13879 3A

SEVERNI NAUCHNO-ISSLEDOVATELSKII INSTITUT GIDROTEKHNIKI I MELIORATSII, LENINGRAD (USSR).
Use of Capillary Columns to Study Infiltration of Water Into Frozen Soil (Skhema kapillyarnykh kolonn dlya vpityvaniya vody v merzlyy grunt),
W72-14031 2G

SHELL OIL CO., HOUSTON TEX. TECHNICAL SERVICES DIV.
Pressure-Differential Sticking of Drill Pipe and How it Can be Avoided or Relieved,
W72-13630 8C

SHELL RESEARCH LTD., CHESTER (ENGLAND). THORNTON RESEARCH CENTER.
A Review of the Methods for the Identification of Persistent Hydrocarbon Pollutants on Seas and Beaches,
W72-13766 5A

SHELL RESEARCH LTD., EGHAM (ENGLAND). EGHAM RESEARCH LABS.
Biodegradation of Synthetic Detergents Evaluation by Community Trials: 1. Linear Alkylbenzene Sulfonates,
W72-13703 5D

SOIL CONSERVATION SERVICE, COCOA,BEACH, FLA.
Soil Suitability for Spray Irrigation,
W72-13706 5D

SOIL CONSERVATION SERVICE, WASHINGTON, D.C.
Winnebago-Bean Creek Watershed, Richardson County, Nebraska (Draft Environmental Impact Statement).
W72-13951 4D

Winnebago-Bean Creek Watershed, Nebraska (Final Environmental Impact Statement).
W72-13966 4D

SOUTHERN CALIFORNIA COASTAL WATER RESEARCH PROJECT, LOS ANGELES.
Mussels and Barnacles as Indicators of the Variation of Manganese-54, Cobalt-60 and Zinc-65 in the Marine Environment,
W72-13978 5B

SOUTHERN ILLINOIS UNIV., CARBONDALE.
Use of Ultraviolet Light to Increase the Availablity of Aerial Insects to Caged Bluegill Sunfish,
W72-14140 2I

SRI PRATAP COLL., SRINAGAR (INDIA). DEPT. OF BOTANY.
Ecology and Production of Salvinia Natans Hiffim; In Kasmir,
W72-14071 2H

STANDARD OIL AND GAS CO., TULSA, OKLA.
Ability of Drilling Mud to Lift Bit Cuttings,
W72-13629 8B

STANOLIND OIL AND GAS CO., TULSA, OKLA.
An Analysis and the Control of Lost Circulation,
W72-13627 8B

STATE UNIV., OF NEW YORK, ALBANY. DEPT. OF BIOLOGICAL SCIENCES.
Influences of Thermal Effluents Upon Aquatic Production in Lake Ontario,
W72-13642 5C

STATE UNIV. OF NEW YORK, STONY BROOK. MARINE SCIENCES RESEARCH CENTER.
Study of Environmental Impacts of Alternative Long Island Sound Bridge Sites,
W72-13907 6G

STATE UNIVERSITY OF NEW YORK, BUFFALO, DEPT. OF BIOLOGY; AND STATE UNIV. COLL., BUFFALO. GREAT LAKES LAB.
Development of a Theoretical Seasonal Growth Response Curve of Cladophora Glomerata to Temperature and Photoperiod,
W72-13651 5C

STICHTING VOOR FUNDAMENTEEL ONDERZOEK DER MATERIE, AMSTERDAM (NETHERLANDS). ISTITUUT VOOR ATOOM EN MOLECUULFYSICA.
A Technique for Curie Point Pyrolysis Gas Chromatography of Complex Biological Samples,
W72-13761 5A

STOCKHOLM UNIV. (SWEDEN). DEPT. OF ZOOLOGY.
Northerly Localities for Three Aquatic Plants, Lemna Trisulca L., Ceratophyllum Demersum L., and Myriophyllum Spicatum L.,
W72-14141 2I

SUN OIL CO., MARCUS, HOOK, PA.
Microdetermination of Carbon, Hydrogen, Nitrogen and Oxygen in Petroleum Compounds with an Automatic Elemental Analyzer,
W72-13805 5A

Titrimetric Determination of Trace Sulfur in Petroleum Using a Lead Ion Selective Electrode,
W72-13806 5A

SYDNEY UNIV. (AUSTRALIA). DEPT. OF SOIL SCIENCE.
Infiltration and Structural Changes as Influenced by Initial Moisture Content,
W72-14196 2G

SYRACUSE UNIV. RESEARCH INST., N.Y.
Freezing Process Studies,
W72-14070 3A

SZKOLA GLOWNA GOSPODARSTWA WIEJSKIEGO, WARSAW (POLAND).
Participation of Moisture Rising from Ground Water in Covering Water Deficiencies Between Evapotranspiration and Precipitations, (In Polish),
W72-14177 2G

TAHAL CONSULTING ENGINEERS LTD., TEL-AVIV (ISRAEL). RESEARCH AND DEVELOPMENT DIV.
Dynamic Multisector Programming Approach to Regional Water Resource Management,
W72-13933 6A

TATE AND LYLE LTD., KESTON (ENGLAND). RESEARCH LAB.
Effects of Environmental Conditions and the Coadministration of Growth Retardants on the Response of Sugarcane to Foliar Treatment with Gibberellin,
W72-13924 3F

TEL-AVIV UNIV. (ISRAEL). DEPT. OF MICROBIOLOGY.
Synchronization of Cell Division in Escherichia Coli by Elevated Temperatures: A Reinterpretation,
W72-13666 5C

TENNESSEE UNIV., KNOXVILLE. DEPT. OF CIVIL ENGINEERING.
Virus Rem Oval by Chemical Coagulation,
W72-13684 5D

TEXACO INC., NEW YORK (ASSIGNEE).
Treatment of Waste Liquors from Pulp and Paper Mills,
W72-13896 5D

TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF OCEANOGRAPHY.
The Geochemistry of Radiocarbon in the Gulf of Mexico,
W72-13981 5B

TEXAS AGRICULTURAL EXTENSION SERVICE, COLLEGE STATION.
Declaring War....On Mesquite,
W72-13925 3B

TEXAS UNIV., AUSTIN.
Two-Dimensional Study of Rock Breakage in Drag-Bit Drilling at Atmospheric Pressure,
W72-13625 8C

TEXAS UNIV., AUSTIN. DEPT. OF CHEMICAL ENGINEERING.
Process Modeling of Biological Waste Treatment,
W72-13694 5D

TEXAS UNIV., AUSTIN. DEPT. OF ENVIRONMENTAL HEALTH AND ENGINEERING.
Nutrient Studies in Texas Impoundments,
W72-13692 5C

TEXAS UNIV., AUSTIN. DEPT. OF ZOOLOGY.
Competition and Isolation Mechanisms in the Gambusia Affinis X G. Heterochir Hybrid Swarm,
W72-13718 8H

TEXAS UNIV., EL PASO. DEPT. OF GEOLOGICAL SCIENCES.
Nonantecedent Development of Truckee River Canyon, Northern Carson Range, Nevada and California,
W72-14015 2J

TEXAS WATER QUALITY BOARD, AUSTIN.
The Disposal Well Act.
W72-14050 6E

TORONTO UNIV. (ONTARIO). DEPT. OF ZOOLOGY.
Respiratory and Circulatory Responses of Rainbow Trout Larvae to Carbon Monoxide and to Hypoxia,
W72-14146 5C

TRENT UNIV., PETERBOROUGH (ONTARIO).
Semiintegral Electroanalysis: Theory and Verification,
W72-13791 2K

TRINITY COLL., DUBLIN (IRELAND).
Morphometric Analysis of Polygonal Karst in New Guinea,
W72-14018 2J

TRW SYSTEMS GROUP, REDONDO BEACH, CALIF.
Research on Ion Transport Across Microbial Membranes,
W72-14084 3A

TULSA UNIV., OKLA.
How Rotary Speed and Bit Weight Affect Rotary Drilling Rate,
W72-13631 8C

TYCO LABS. INC., WALTHAM, MASS.
Anomalous Water,
W72-13842 1B

UDAIPUR UNIV. (INDIA).
Effect of Moisture Stress and Indolebutyric Acid on Rooting of Stem Cuttings of Pomegranate (Punica Granatum L.),
W72-14123 3F

UMEA UNIV., (SWEDEN). DEPT. OF ORGANIC CHEMISTRY.
An Artifact in the Gas Chromatographic Determination of Impurities in Pentachlorophenol,
W72-13774 5A

UNION CARBIDE CORP., TUXEDO, N.Y.
A Neutron Scattering Study of the Kinetics of Diffusion and the Relation to the Structures of Ionic Solutions,
W72-14067 1B

UNIVERSITY COLL. OF NORTH WALES, BANGOR. DEPT. OF ZOOLOGY.
Intraspecific Competition in Lake-Dwelling Triclads: A Laboratory Study,
W72-14132 2H

UNIVERSITY COLL. OF NORTH WALES, MENAI BRIDGE. MARINE SCIENCE LABS.
A New Light Trap for Plankton,
W72-13797 5A

UNIVERSITY COLL. OF WALES, ABERYSTWYTH. DEPT. OF AGRICULTURAL BIOCHEMISTRY; AND UNIVERSITY COLL.

OF WALES, ABERYSTWYTH. DEPT. OF BIOCHEMISTRY.
Nickel Pollution,
W72-13778 5A

UNIVERSITY OF NEW ENGLAND, ARMIDALE (AUSTRALIA). DEPT. OF ZOOLOGY.
Studies on Anuran Water Balance: II. Desiccation in the Australian Frog, Notaden Bennetti,
W72-14133 2I

UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES.
Oil Pollution of the Marine Environment - A Legal Bibliography,
W72-13904 5G

UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES. DEPT. OF BIOLOGICAL SCIENCES.
Preliminary Report on Techniques for Marine Monitoring Systems,
W72-13850 5B

UTTAR PRADESH AGRICULTURAL UNIV., NAINI TAL (INDIA). DEPT. OF PLANT PATHOLOGY.
Perpetuation of Bacterial Blight Disease of Paddy and Preservation of Its Incitant: I. Survival of Xanthomonas Oryzae in Water,
W72-14118 5C

VICTORIAN WHEAT RESEARCH INST., HORSHAM (AUSTRALIA).
Skeleton Weed (Chondrilla Juncea) in the Victorian Mallee: V. Chemical Fallowing,
W72-13708 3F

VIRGINIA INST. OF MARINE SCIENCE, GLOUCESTER POINT.
Salinity Tolerance of Young Blueback Herring, Alosa Aestivalis,
W72-13870 5C

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG.; AND CHRISTIAN HERITAGE COLL., SAN DIEGO, CALIF.
Roughness Elements as Energy Dissipators of Free-Surface Flow in Circular Pipes,
W72-13747 8B

VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. RESEARCH DIV.
Evaluation of a Deterministic Model for Predicting Water Yields from Small Agricultural Watersheds in Virginia,
W72-13824 2A

VOJNOMEDICINSKA AKADEMIJA, BELGRADE (YUGOSLAVIA). HIGIJENSKOHEM. INST.
Co-precipitation Applied in the Determination of Lead in Drinking Water, (In Serbo-Croatian),
W72-14179 5A

VOLCANI INST. OF AGRICULTURAL RESEARCH, BET-DAGAN (ISRAEL).
Soil Water Regime in Economic Evaluation of Salinity in Irrigation,
W72-13932 3C

VRIJE UNIVERSITEIT, AMSTERDAM (NETHERLANDS). INST. OF EARTH SCIENCES.
Buried Channel Aquifers and Present Open Drainage System of East Gelderland, The Netherlands,
W72-13722 2F

VYZKUMNY USTAV RYBARSKY A HYDROBIOLOGICKY VODNANY, PRAGUE (CZECHOSLOVAKIA).
Some Haematological and Metabolic Changes in Fish Occurring After Pesticide Intoxication (Nektere Hematologicke A Metabolicke Zmenyuryb po Intoxikaci Pesticidy),
W72-13873 5C

WADSWORTH GENERAL HOSPITAL, LOS ANGELES, CALIF.
Osmotic Stability and Sodium and Potassium Content of L-Forms of Streptococcus Faecalis,
W72-13764 5C

WASHINGTON STATE UNIV., PULLMAN.
Ozonation Reactions of Selected Pesticides for Water Pollution Abatement,
W72-13685 5G

WASHINGTON UNIV., SEATTLE.
Mortality of Pacific Oysters (Crassotrea GIGas): The Influence of Temperature and Enriched Seawater on Oyster Survival,
W72-13875 5C

WASHINGTON UNIV., SEATTLE. DEPT. OF OCEANOGRAPHY.
Sorption-Desorption Reactions of Mercury with Suspended Matter in the Columbia River,
W72-13972 5B

WASTECH, INC., HOUSTON, TEX.
Liquid Treating Apparatus,
W72-13878 5D

WATERLOO UNIV. (ONTARIO); AND CONSTRUCTION FOR THE GOVERNMENT OF THE NORTHWEST TERRITORIES, YELLOWKNIFE.
Column Load Influence on Reinforced Concrete-Beam Column Connection,
W72-13748 8F

WATERLOO UNIV. (ONTARIO). DEPT. OF BIOLOGY.
Evidence for the Eutrophication of Lake Ontario from the Sedimentary Diatom Succession,
W72-13641 5C

WATERLOO UNIV. (ONTARIO). DEPT. OF PHYSICS.
Measurements of Very Low Oxygen Tensions in Unstirred Liquids,
W72-13785 5A

WATERLOOPKUNDIG LABORATORIUM, DELFT (NETHERLANDS).
Recent Developments of Physical Investigations in Boreholes and Wells,
W72-13727 4B

WEIZMANN INST. OF SCIENCE, REHOVOTH (ISRAEL). POLYMER DEPT.
Water Transport in Hyperfiltration Membranes,
W72-14072 3A

Transport Processes in Hyperfiltration Membranes I,
W72-14083 3A

WEST VIRGINIA DEPT. OF NATURAL RESOURCES, CHARLESTON. DIV. OF WATER RESOURCES.
West Virginia Water Quality Network.
W72-14048 7B

WESTERN REGION RESEARCH LAB., BERKELEY, CALIF.
Cell Size in Russet Burbank Potato Tubers With Various Levels of Nitrogen and Soil Moisture Tensions,
W72-14124 3F

WISCONSIN DEPT. OF NATURAL RESOURCES, MADISON.
Responses of a Brook Trout (Salvelinus Fontinalis) Population to Habitat Development in Lawrence Creek,
W72-14108 8I

Evaluation of Intensive Freshwater Drum (Aplodinotus Grunniens) Removal in Lake Winnebago, Wisconsin, 1955-1966,
W72-14109 2H

Growth of Known Age Muskellunge (Esox Masquinongy) in Wisconsin and Validation of Age and Growth Determination Methods,
W72-14110 2I

Harvest and Feeding Habitats of Largemouth Bass (Micropterus Salmoides) in Murphy Flowage, Wisconsin,
W72-14114 8I

WISCONSIN UNIV., MADISON. DEPT. OF BACTERIOLOGY.
Viruses in Water and Wastewater: Effects of some Treatment Methods,
W72-13614 5F

WISCONSIN UNIV., MADISON. DEPT. OF ENTOMOLOGY.
DDT: Inhibition of Sodium Chloride Tolerance by the Blue-Green Alga Anacystis Nidulans,
W72-13809 5C

WISCONSIN UNIV., MADISON. DEPT. OF FOOD SCIENCE.
Loss of Viability by Staphylococcus Aureus in Acidified Media. I., Inactivation by Several Acids, Mixtures of Acids, and Salts of Acids,
W72-13777 5C

WISCONSIN UNIV., MADISON. DEPT. OF GEOLOGY AND GEOPHYSICS.
Chronology of a Kettle-Hole Peat Bog, Cherryfield, Maine,
W72-14019 2J

WISCONSIN UNIV., MADISON. FOOD RESEARCH INST.
Growth of Salmonella Typhimurium in Skim Milk Concentrates,
W72-13818 5A

WISCONSIN UNIV., MADISON. WATER CHEMISTRY PROGRAM.
PCBs in Fish from the Milwaukee Region,
W72-13652 5C

WISCONSIN UNIV., MADISON. WATER RESOURCES CENTER.
Delayed Yield and Unsaturated Flow Above a Falling Water Table,
W72-14052 2G

Unsteady Flow of Ground Water,
W72-14053 2F

WISCONSIN UNIV., MILWAUKEE. CENTER FOR GREAT LAKES STUDIES.
The Decline of the Large Zooplankter, Limnocalanus Macrurus Sars (Copepoda: Calanoida), in Lake Erie,
W72-13643 5C

WISCONSIN UNIV., MILWAUKEE. DEPT. OF BOTANY; AND WISCONSIN UNIV., MILWAUKEE. CENTER FOR GREAT LAKES STUDIES.
Availability of Phosphorus for Cladophora Growth in Lake Michigan,
W72-13644 5C

WISCONSIN UNIV., MILWAUKEE. DEPT. OF CHEMISTRY, AND WISCONSIN UNIV., MILWAUKEE. LAB. FOR SURFACE STUDIES.
Wax-Bound Lead Dioxide Potentiometric Electrode and Applications to Chelometric Titration,
W72-13676 5A

WISCONSIN UNIV., MILWAUKEE. DEPT. OF GEOGRAPHY.
Inverse Relation Between Foreshore Slope and Mean Grain Size as a Function of the Heavy Mineral Content,
W72-14016 2J

WITCO CHEMICAL CORP., NEW YORK. (ASSIGNEE).
Method for Preventing Water Loss from Reservoirs and Channels,
W72-13889 4A

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.
Oil Pollution: Persistence and Degradation of Spilled Fuel Oil,
W72-13810 5B

Atlantic Continental Shelf and Slope of the United States-Petrology of the Sand Fraction of Sediments, Northern New Jersey to Southern Florida,
W72-13830 2J

Concentrations and Distributions of Long-Lived Fallout Radionuclides in Open Ocean Sediments,
W72-13980 5B

ZAGREB UNIV. (YUGOSLAVIA). INST. OF INORGANIC AND ANALYTICAL CHEMISTRY.
Solvent Extraction and Separation of Zirconium, Niobium and Tantalum by 2-Carbethoxy-5-Hydroxy-1- (4-Tolyl)-4-Pyridone,
W72-13807 5A

ACCESSION NUMBER INDEX

W72-13610	5F
W72-13611	5F
W72-13612	5F
W72-13613	5F
W72-13614	5F
W72-13615	5F
W72-13616	5F
W72-13617	9C
W72-13618	8C
W72-13619	8C
W72-13620	8A
W72-13621	8G
W72-13622	8G
W72-13623	8G
W72-13624	8G
W72-13625	8C
W72-13626	8C
W72-13627	8B
W72-13628	8C
W72-13629	8B
W72-13630	8C
W72-13631	8C
W72-13632	8G
W72-13633	8A
W72-13634	2B
W72-13635	5D
W72-13636	5C
W72-13637	5C
W72-13638	5D
W72-13639	
W72-13640	5C
W72-13641	5C
W72-13642	5C
W72-13643	5C
W72-13644	5C
W72-13645	5C
W72-13646	5C
W72-13647	5C
W72-13648	5C
W72-13649	5C
W72-13650	5C
W72-13651	5C
W72-13652	5C
W72-13653	5C
W72-13654	5C
W72-13655	5C
W72-13656	5C
W72-13657	5C
W72-13658	5C
W72-13659	5C
W72-13660	5C
W72-13661	5C
W72-13662	5C
W72-13663	5C
W72-13664	5C
W72-13665	5C
W72-13666	5C
W72-13667	5A
W72-13668	5C
W72-13669	5A
W72-13670	5A
W72-13671	5A
W72-13672	5A
W72-13673	5A
W72-13674	5A
W72-13675	2I
W72-13676	5A
W72-13677	5A
W72-13678	5C
W72-13679	5A
W72-13680	2I
W72-13681	5A
W72-13682	5B
W72-13683	5A
W72-13684	5D
W72-13685	5G
W72-13686	5B
W72-13687	5D
W72-13688	5B
W72-13689	5D
W72-13690	5D
W72-13691	5D
W72-13692	5C
W72-13693	5A
W72-13694	5D
W72-13695	5B
W72-13696	5D
W72-13697	5D
W72-13698	6B
W72-13699	5D
W72-13700	2E
W72-13701	5F
W72-13702	5G
W72-13703	5D
W72-13704	5D
W72-13705	5D
W72-13706	5D
W72-13707	5D
W72-13708	3F
W72-13709	5D
W72-13710	5D
W72-13711	5D
W72-13712	5D
W72-13713	3F
W72-13714	7C
W72-13715	7C
W72-13716	7C
W72-13717	2E
W72-13718	8H
W72-13719	5B
W72-13720	2K
W72-13721	2F
W72-13722	2F
W72-13723	4B
W72-13724	4B
W72-13725	2K
W72-13726	4B
W72-13727	4B
W72-13728	2F
W72-13729	7B
W72-13730	2J
W72-13731	2A
W72-13732	2B
W72-13733	4B
W72-13734	2E
W72-13735	2F
W72-13736	2E
W72-13737	2K
W72-13738	2H
W72-13739	5C
W72-13740	6D
W72-13741	5F
W72-13742	5F
W72-13743	6B
W72-13744	8F
W72-13745	8D
W72-13746	8H
W72-13747	8B
W72-13748	8F
W72-13749	8F
W72-13750	8C
W72-13751	8A
W72-13752	8D
W72-13753	8F
W72-13754	8F
W72-13755	2I
W72-13756	8D
W72-13757	2B
W72-13758	8D
W72-13759	4C
W72-13760	5A
W72-13761	5A
W72-13762	5B
W72-13763	7B
W72-13764	5C
W72-13765	5C
W72-13766	5A
W72-13767	5A
W72-13768	5A
W72-13769	7B
W72-13770	7B
W72-13771	5A
W72-13772	5A
W72-13773	5A
W72-13774	5A
W72-13775	5B
W72-13776	5A
W72-13777	5C
W72-13778	5A
W72-13779	5B
W72-13780	5C
W72-13781	5A
W72-13782	5A
W72-13783	5C
W72-13784	5A
W72-13785	5A
W72-13786	5A
W72-13787	5A
W72-13788	5A
W72-13789	5A
W72-13790	5A
W72-13791	2K
W72-13792	5A
W72-13793	5A
W72-13794	5A
W72-13795	5C
W72-13796	5A
W72-13797	5A
W72-13798	5A
W72-13799	2I
W72-13800	5C
W72-13801	5B
W72-13802	2K
W72-13803	5A
W72-13804	5A
W72-13805	5A
W72-13806	5A
W72-13807	5A
W72-13808	7C
W72-13809	5C
W72-13810	5B
W72-13811	5A
W72-13812	5A
W72-13813	5C
W72-13814	5C
W72-13815	2I
W72-13816	5C
W72-13817	5A
W72-13818	5A
W72-13819	5C
W72-13820	10B
W72-13821	9D
W72-13822	5C
W72-13823	6B
W72-13824	2A
W72-13825	5C
W72-13826	5D
W72-13827	7C
W72-13828	2F
W72-13829	6D
W72-13830	2J
W72-13831	7C
W72-13832	5B
W72-13833	4B
W72-13834	5B
W72-13835	2F
W72-13836	4A
W72-13837	2L
W72-13838	2F
W72-13839	5B
W72-13840	5B
W72-13841	2A
W72-13842	1B
W72-13843	2B
W72-13844	2J
W72-13845	2G
W72-13846	2L
W72-13847	5C
W72-13848	2F
W72-13849	2L
W72-13850	5B
W72-13851	5C
W72-13852	2C
W72-13853	2E
W72-13854	4A
W72-13855	7B
W72-13856	5B
W72-13857	4A
W72-13858	3F
W72-13859	7B
W72-13860	2J
W72-13861	8B
W72-13862	7B
W72-13863	7B
W72-13864	5C
W72-13865	5C
W72-13866	2K
W72-13867	5C
W72-13868	5C
W72-13869	5C
W72-13870	5C
W72-13871	5C
W72-13872	5A
W72-13873	5C
W72-13874	5C
W72-13875	5C
W72-13876	7B
W72-13877	5D
W72-13878	5D
W72-13879	3A
W72-13880	5D
W72-13881	5A
W72-13882	3A
W72-13883	5D
W72-13884	5G
W72-13885	3A
W72-13886	3A
W72-13887	5F
W72-13888	5D
W72-13889	4A
W72-13890	5G
W72-13891	5G
W72-13892	3A
W72-13893	5D
W72-13894	5G
W72-13895	5D
W72-13896	5D
W72-13897	3A
W72-13898	3A
W72-13899	5D
W72-13900	5D
W72-13901	5D
W72-13902	5D
W72-13903	5A
W72-13904	5G
W72-13905	5C
W72-13906	5G
W72-13907	6G
W72-13908	6G
W72-13909	2I
W72-13910	2I
W72-13911	3F
W72-13912	3B
W72-13913	4A
W72-13914	4A
W72-13915	6E
W72-13916	2G
W72-13917	3B
W72-13918	2G
W72-13919	3F
W72-13920	5G
W72-13921	3F

W72-13922	2G
W72-13923	2G
W72-13924	3F
W72-13925	3B
W72-13926	3F
W72-13927	2H
W72-13928	4A
W72-13929	6A
W72-13930	6A
W72-13931	5G
W72-13932	3C
W72-13933	6A
W72-13934	6A
W72-13935	5G
W72-13936	6D
W72-13937	5G
W72-13938	5G
W72-13939	6E
W72-13940	5G
W72-13941	6E
W72-13942	5G
W72-13943	5G
W72-13944	6E
W72-13945	6E
W72-13946	5B
W72-13947	5G
W72-13948	6E
W72-13949	5D
W72-13950	5G
W72-13951	4D
W72-13952	8A
W72-13953	5G
W72-13954	5G
W72-13955	8D
W72-13956	8A
W72-13957	6B
W72-13958	3A
W72-13959	6G
W72-13960	4A
W72-13961	4A
W72-13962	4A
W72-13963	8D
W72-13964	4A
W72-13965	8D
W72-13966	4D
W72-13967	4A
W72-13968	8D
W72-13969	3E
W72-13970	5B
W72-13971	5B
W72-13972	5B
W72-13973	5B
W72-13974	5B
W72-13975	5B
W72-13976	5B
W72-13977	5B
W72-13978	5B
W72-13979	5B
W72-13980	5B
W72-13981	5B
W72-13982	5B
W72-13983	5G
W72-13984	5B
W72-13985	5A
W72-13986	5B
W72-13987	5A
W72-13988	5A
W72-13989	5A
W72-13990	5A
W72-13991	5B
W72-13992	5A
W72-13993	6D
W72-13994	6D
W72-13995	2C
W72-13996	2C
W72-13997	5C
W72-13998	5C
W72-13999	5C
W72-14000	2H
W72-14001	2F
W72-14002	4C
W72-14003	2E
W72-14004	2F
W72-14005	2A
W72-14006	2G
W72-14007	2A
W72-14008	2F
W72-14009	3F
W72-14010	2H
W72-14011	2F
W72-14012	5B
W72-14013	2E
W72-14014	2J
W72-14015	2J
W72-14016	2J
W72-14017	2J
W72-14018	2J
W72-14019	2J
W72-14020	2J
W72-14021	2E
W72-14022	5B
W72-14023	4B
W72-14024	5G
W72-14025	2J
W72-14026	2J
W72-14027	4B
W72-14028	6D
W72-14029	2F
W72-14030	5C
W72-14031	2G
W72-14032	2E
W72-14033	2C
W72-14034	2J
W72-14035	2J
W72-14036	2J
W72-14037	2C
W72-14038	4A
W72-14039	2B
W72-14040	8B
W72-14041	3C
W72-14042	8I
W72-14043	7B
W72-14044	6E
W72-14045	7B
W72-14046	5B
W72-14047	5D
W72-14048	7B
W72-14049	5D
W72-14050	6E
W72-14051	5A
W72-14052	2G
W72-14053	2F
W72-14054	5C
W72-14055	2F
W72-14056	5C
W72-14057	5A
W72-14058	3A
W72-14059	3A
W72-14060	1B
W72-14061	3A
W72-14062	1B
W72-14063	5E
W72-14064	5B
W72-14065	3A
W72-14066	5A
W72-14067	1B
W72-14068	3A
W72-14069	3A
W72-14070	3A
W72-14071	2H
W72-14072	3A
W72-14073	3A
W72-14074	3A
W72-14075	3A
W72-14076	3A
W72-14077	2D
W72-14078	3A
W72-14079	3A
W72-14080	3A
W72-14081	3A
W72-14082	3A
W72-14083	3A
W72-14084	3A
W72-14085	3A
W72-14086	5B
W72-14087	3A
W72-14088	3A
W72-14089	3F
W72-14090	3F
W72-14091	3F
W72-14092	2I
W72-14093	5C
W72-14094	3F
W72-14095	5C
W72-14096	2I
W72-14097	3F
W72-14098	2I
W72-14099	2I
W72-14100	2I
W72-14101	3F
W72-14102	2D
W72-14103	3F
W72-14104	5B
W72-14105	3F
W72-14106	3F
W72-14107	2H
W72-14108	8I
W72-14109	2H
W72-14110	2I
W72-14111	8I
W72-14112	8I
W72-14113	8I
W72-14114	8I
W72-14115	2I
W72-14116	2I
W72-14117	5C
W72-14118	5C
W72-14119	2I
W72-14120	7B
W72-14121	2I
W72-14122	6G
W72-14123	3F
W72-14124	3F
W72-14125	3F
W72-14126	3C
W72-14127	2H
W72-14128	2L
W72-14129	7B
W72-14130	2I
W72-14131	5C
W72-14132	2H
W72-14133	2I
W72-14134	5C
W72-14135	5C
W72-14136	7B
W72-14137	6G
W72-14138	7B
W72-14139	5C
W72-14140	2I
W72-14141	2I
W72-14142	2I
W72-14143	2I
W72-14144	2I
W72-14145	2I
W72-14146	5C
W72-14147	2I
W72-14148	2E
W72-14149	2I
W72-14150	3F
W72-14151	3F
W72-14152	3F
W72-14153	5B
W72-14154	5C
W72-14155	3F
W72-14156	5F
W72-14157	5F
W72-14158	5C
W72-14159	2I
W72-14160	2H
W72-14161	5C
W72-14162	2I
W72-14163	5C
W72-14164	5C
W72-14165	4A
W72-14166	2H
W72-14167	5C
W72-14168	2I
W72-14169	5B
W72-14170	4D
W72-14171	2J
W72-14172	3F
W72-14173	2G
W72-14174	4D
W72-14175	2J
W72-14176	2I
W72-14177	2G
W72-14178	2G
W72-14179	5A
W72-14180	3F
W72-14181	2H
W72-14182	5C
W72-14183	2I
W72-14184	7B
W72-14185	7B
W72-14186	5B
W72-14187	5C
W72-14188	5C
W72-14189	2G
W72-14190	2G
W72-14191	5A
W72-14192	7B
W72-14193	5B
W72-14194	7B
W72-14195	3F
W72-14196	2G
W72-14197	2G
W72-14198	5B
W72-14199	5B
W72-14200	2G

ABSTRACT SOURCES

Source	Accession Number	Total
A. Centers of Competence		
AEC Oak Ridge National		
AEC Oak Ridge National Laboratory, Nuclear Radiation and Safety	W72-13970 – 13991	22
American Water Works Association Research Foundation, Public Water Supply Treatment Technology	W72-13610 – 13616	7
Battelle Memorial Institute, Methods for Chemical and Biological Identification of Pollutants	W72-13666 – 13674 13676 – 13677 13679 13681 – 13683 13760 – 13798 13800 13802 – 13814 13816 – 13818	71
Bureau of Reclamation, Engineering Works	W72-13744 – 13754 13756, 13758	13
Cornell University, Policy Models for Water Resources Systems	W72-13929 – 13936	8
National Water Well Association, Water Well Construction Technology	W72-13618 – 13633	16
Oceanic Research Institute, Coastal Pollution	W72-13903 – 13908 13910	7
University of Arizona, Arid Land Water Resources	W72-13911 – 13917 13919 – 13923 13925 – 13928	16
University of Chicago, Metropolitan Water Resources Management	W72-13741 – 13743	3
University of Florida, Eastern U. S. Water Law	W72-13937 – 13945 13947 – 13969	32
University of Texas, Wastewater Treatment and Management	W72-13638 – 13639 13684 – 13694 13696 – 13707 13709 – 13712	29
University of Washington, Water Quality Requirements	W72-13864 – 13875	15
University of Washington, Water Quality Requirements for Aquatic Organisms	W72-13864 – 13875 13997 – 13999	15
University of Wisconsin, Eutrophication	W72-13640 – 13665	26
U. S. Geological Survey, Hydrology	W72-13714 – 13717 13719 – 13737 13739 – 13740 13820 13827 – 13846 13848 – 13863 14001 – 14041	103

ABSTRACT SOURCES

Source	Accession Number	Total
B. State Water Resources Research Institutes		
Arizona Water Resources Research Center	W72-13994 -- 13996	3
Georgia Environmental Resources Center	W72-13634	1
Nevada Center for Water Resources Research	W72-14054 -- 14055	2
New Hampshire Water Resources Research Center	W72-14056 -- 14057	2
New Mexico Water Resources Research Institute	W72-13992 -- 13993	2
North Carolina Water Resources Research Institute	W72-13635 -- 13636	3
Wisconsin Water Resources Center	W72-14052 -- 14053	2
C. Other		
BioSciences Information Service	W72-13637, 13675 13678, 13680 13695, 13708 13713, 13718 13738, 13755 13757, 13799 13801, 13815 13819, 13847 13909, 13918 13924, 13946 14000, 14042 14071 14089 -- 14200	135
Engineering Aspects of Urban Water Resources (Poertner)	W72-14043 -- 14051	9
Ocean Engineering Information Service	W72-13876 -- 13902	27
Office of Saline Water	W72-14058 -- 14070 14072 -- 14088	30
Office of Water Resources Research	W72-13617	1

* U. S. GOVERNMENT PRINTING OFFICE : 1972 O - LT - 511-615 (9)

CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation. Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public water supply treatment technology at the American Water Works Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agenc
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows, at the Department of Agricultural Engineering of Colorado State University.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

10 SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

U.S. DEPARTMENT OF COMMERCE
National Technical Information Service
Springfield, Va. 22151

OFFICIAL BUSINESS

PRINTED MATTER

U.S.MAIL

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF COMMERCE
211

LIBRARY
JAN 31 1973
PACIFIC POWER & LIGHT COMPANY

AN EQUAL OPPORTUNITY EMPLOYER

SWRA X721231
PACIFIC POWER AND LIGHT CO
W L HUTCHINSON LIBRARIAN
PUBLIC SERVICE BLDG
PORTLAND OR 97204